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OF

OTOLOGY

EDITED IN ENGLISH AND GERMAN

BY

DR. H. KNAPP,
OF NEW YORK.

PROF. S. MOOS, M. D.,
OF HEIDELBERG.

AND

DR. D. B. ST. JOHN ROOSA,
OF NEW YORK.

IN CONJUNCTION WITH

Dr. C. R. AGNEW, of New York; Prof. E. BERTHOLD, of Königsberg; Dr. G. BRUNNER, of Zurich; Dr. SWAN M. BURNETT, of Washington; Dr. E. GRUENING, of New York; Dr. A. HARTMANN, of Berlin; Dr. L. LOEWE, of Bern; Dr. C. J. KIPP, of Newark; Dr. B. LOEWENBERG, of Paris; Dr. J. PATTERSON CASSELS, of Glasgow; Prof. E. DE ROSSI, of Rome; Dr. R. SCHALLE, of Hamburg; Dr. H. STEINBRUEGGE, of Heidelberg; Dr. O. WOLF, of Frankfort-on-the-Main; Prof. R. WREDEN, of St. Petersburg; and many others.

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CONTENTS OF VOLUME VIII.

NUMBER I.

1. Primary Acute Purulent Inflammation of the Middle Ear. By H. Knapp. 1
2. On the Formation of Sequestra in the Mastoid Process of the Child. By Dr. Arthur Hartmann, of Berlin. Translated by Dr. James A. Spalding, of Portland, Maine. 26
3. On the Sinus Tympani. By Dr. H. Steinbrügge, in Heidelberg. Translated by Dr. James A. Spalding, of Portland, Maine. . 53
4. Experiments with Edison's Phonograph. By Dr. Oscar Wolf, of Frankfort-on-the-Main. Translated by Dr. Swan M. Burnett, of Washington, D. C. (With six woodcuts.) 58
5. Clinical Contributions to Otology. From the Practice of Dr. C. R. Agnew. Reported by Dr. David Webster, of New York. . 65
6. Extensive Caseous Osteitis of the Mastoid Process and Petrous Bone, Caused by Chronic Purulent Inflammation of the Middle Ear.—Operation.—Permanent Fistula of the Mastoid.—Recovery. By A. G. Gerster, M.D., of New York. 81
7. On the Indications for Opening the Mastoid Process in Cases of Otitis Media Purulenta Acuta with Implication of the Mastoid Cells. By Dr. Emil Gruening, of New York. 84
8. Report on the Progress of Otology in the first half of the Year 1878.
    I. Normal and Pathological Anatomy and Histology of the Organ of Hearing. By H. Steinbrügge, of Heidelberg. Translated from the German edition, by Isidor Furst, of New York. 89
    II. Physiology of the Organ of Hearing. By Oscar Wolf, of Frankfort-on-the-Main. Translated by Isidor Furst, of New York. 98
    III. Embryology and Comparative Anatomy of the Organ of Hearing. By L. Löwe, of Berlin. Translated by Isidor Furst, of New York. 104

NUMBER 2.

1. Contributions to the Pathology and Pathological Anatomy of the Organ of Hearing, by Prof. S. Moos. Translated by Dr. Swan M. Burnett, of Washington, D. C. 113

2. A Case of Objective Aural Sounds. By Dr. E. L. Holmes, of Chicago. . . . 144
3. Four Cases of Intracranial Disease Caused by Chronic Suppuration of the Middle Ear. Two Recoveries and Two Deaths. By Dr. Charles J. Kipp, of Newark, N. J. . . . 147
4. Condylomata of Both External Ear Canals. By H. Knapp. . 165
5. A Case of Tumor of the Auditory Nerve Occupying the Fossa for the Cerebellum. By Geo. T. Stevens, M.D., of Albany, N. Y. 171
6. A New Test for Simulated One-sided Deafness. By David Coggin, M.D., of Salem, Mass. . . . 177
7. Note on the Treatment of Acute Suppuration of the Middle Ear. By Dr. Edward T. Ely, of New York. . . . 178
8. Abstract of American Otological Literature for the first quarter of 1879. By Dr. Swan M. Burnett, of Washington, D. C. . . 183
9. Report on the Progress of Otology in the first half of the Year 1878. (Continued from page 111.) . . .
   IV. Pathology and Therapeutics of the Organ of Hearing. By A. Hartmann, of Berlin. Translated by Isidor Furst, of New York. . . . 187
   I. Normal and Pathological Anatomy and Histology of the Organ of Hearing. By H. Steinbrügge, of Heidelberg. Translated by Isidor Furst, of New York. . . . 205
   II. Physiology of the Organ of Hearing. By Oscar Wolf, of Frankfort-on-the-Main. Translated by Isidor Furst, of New York. . . . 207

NUMBER 3.

1 An Instrument for Removing Fluids from the Tympanum. By Dr. Schalle, of Hamburg. Translated by James A. Spalding, M.D., Portland, Maine, . . . 215
2. A Case of Closure of the Auditory Meatus and loss of Hearing by the Formation of Exostoses, Complicated with Acute Perforative Inflammation of the Middle Ear, with Repeatedly Recurring Granulations.—Restoration by the Use of Laminaria and Galvano-Cautery. By S. Moos, of Heidelberg. Translated by James A. Spalding, M.D., Portland, Maine. . . . 223
3. The Use of Toynbee's Artificial Ear-Drum. By Charles E. Hackley, M.D., of New York. . . . 228
4. Four Cases of Severe Disease of the Mastoid Process. By S. Moos, of Heidelberg. Translated by James A. Spalding, M.D., Portland, Maine. . . . 231
5. On Branchial Fistulæ at the External Ear. By Dr. D. Schwabach, of Berlin. Translated by James A. Spalding, M.D., of Portland, Maine. . . . 246

6. Analysis of the Tones Included in the Secondary Noise of an Intermitting Tuning-Fork. By Dr. E. Berthold, of Königsberg. Translated by James A. Spalding, M.D., of Portland, Maine. . 250

7. A Case of Acute Inflammation of the Middle Ear, with Inflammation of the Muscles of the Neck, and Facial Paralysis of the same side. Recovery. With some Remarks upon the Indications for Wilde's Incision and Trephining the Mastoid Process. By Dr. D. B. St. John Roosa, of New York. 255

8. The Histology of the Inferior Turbinated Bones, and of the Teleangiectatic Fibromata arising from them. By H. Steinbrügge, M.D., of Heidelberg. Translated by Dr. Richard C. Brandeis, New York. (With Plates I and II.) 269

9. Abstract of American Otological Literature for the Second Quarter of 1879. By Swan M. Burnett, Washington, D. C. . . 284

10. Report on the Progress of Otology in the first half of the Year 1878.
    IV. Pathology and Therapeutics of the Organ of Hearing. By A. Hartmann, of Berlin. Translated by Isidor Furst, of New York. 288

NUMBER 4.

1. A Case of Parotidean and Intra-Tympanic Malignant Tumor. By H. Knapp. With notes from Drs. H. B. Sands and A. H. Buck of New York, and Drs. S. H. Peck and S. J. Parker of Ithaca, N. Y. 311

2. On Sclerosis of the Mastoid Process. By Dr. Arthur Hartmann, Berlin. Translated by James A. Spalding, M.D., Portland, Me. 322

3. On a Traumatic, Movable Haematoma of the Membrana Tympani. By Prof. S. Moos, of Heidelberg. Translated by James A. Spalding, M.D., Portland, Me. 332

4. Syphilitic Diseases of the Internal Ear. Being a Review of some Recents Papers upon this Subject. By D. B. St. John Roosa, M.D. 336

5. ——— A New Aural Douche. 355

6. Objective Aural Sounds Produced by Voluntary Contraction of the Tubal Muscles. By Swan M. Burnett, M.D., of Washington, D.C. 357

7. Report of the Proceedings of the Section of Otology of the British Medical Association, held at Cork, August, 1879. (Being an abstract of the Report published in the *British Medical Journal*, August 30, 1879.) By Dr. F. P. Capron, of Yonkers, N.Y. . 360

8. An Abstract of American Otological Literature for the Third Quarter of 1879. By Swan M. Burnett, of Washington. . . 370

9. The Audiphone and Dentaphone. By Chas. S. Turnbull, M.D., of Philadelphia. (With two wood-cuts.) 373

10. Report of the Progress of Otology in the second half of the Year 1878.
  - I. Report on Normal and Pathological Anatomy. By Dr. H. Steinbrügge. Translated by James A. Spalding, M.D., Portland, Me. 381
  - II. Physiology of the Organ of Hearing. By Dr. Oscar Wolf, of Frankfort-on-the-Main. 388
  - IV.* Pathology and Therapeutics of the Organ of Hearing. By Dr. A. Hartmann, Berlin. 399

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* Section iii, Embryology and Comparative Anatomy of the Ear, had, for want of space, to be reserved for the next number.

PREFACE.

THE ARCHIVES OF OTOLOGY are the continuation of the otological part, and the Archives of Ophthalmology the continuation of the ophthalmological part of the *Archives of Ophthalmology and Otology.* This division has been made, both for the convenience of many readers, who practice either ophthalmic or aural surgery exclusively, and for the sake of doing justice to the growing importance of the literature in both departments. The English and the German edition have hitherto contained the same original papers, either in the language of the authors or in faithful translations. This plan will be essentially continued ; but if the contributions become too numerous, some papers will be abridged in the translation. The editors will take care that by this condensation as little as possible of the author's investigation and thought is lost. If a paper is not translated *in extenso*, it will be so stated, in order to admit of reference to the original, should controversies of priority occur.

The review of the current literature, hitherto contained in the English edition only and consisting of selections, will in future appear in both editions and constitute a systematic and complete, though concise report on the progress of Otology.

Profiting by their past experience and relying on a great number of prominent men as regular contributors, the editors feel assured of being able to furnish to their readers a *good journal*, presenting the actual state and the progress of aural surgery in all its branches. In their selections the editors will give preference to those original papers in which speculation and theory are subordinate to observation and fact.

VOL. VIII. No. 1.

ARCHIVES OF OTOLOGY.

PRIMARY ACUTE PURULENT INFLAMMATION OF THE MIDDLE EAR.*

By H. KNAPP.

WHEN I began practice in New York ten years ago, so many cases of acute inflammation of the middle ear fell under my notice that I was led to the inference that acute diseases of the ear were relatively more frequent in this country than in Europe, particularly in Germany. I thought that this disproportion was owing to the climate and situation of my new dwelling-place. The climate of New York is distinguished not only by the extremes of heat and cold during the year, but by abrupt and great changes of temperature during the same day. Only two to three months in the year, from the middle of September to the beginning of December, are free from these sudden changes, showing a mild and uniform climate, which, I think, is as pleasant and exhilarating as may be found anywhere on the globe. Among the beauties of the American autumn, I will mention only the gorgeousness and long duration of the changing colors of the forest, that astonish every European. The situation of New York near the ocean, favors, on account of the well-known dangers of sea-bathing, the occurrence of acute inflammation of the ear. These considerations, which I have always kept in mind, have originated the following paper, in which I purpose to discuss one of the most important of the acute diseases of the ear, the primary perforative otitis media, in regard to its relative frequency, its etiology, duration, termination, and the results of different modes of treatment. The discussion will be based on a somewhat extensive material of personal observation, yet comparison with the experience of others will not be omitted. In describing the causes and the course of the disease under consideration, I shall make use of my private practice only, since the observations and notes taken from private patients are more detailed and reliable than those taken from hospital patients. I beg here to state that no patient is counted twice. If a patient went from clinical into private practice, or *vice versa,* this was noted in the book, and he received no new number, but the number of the last patient, with an index, in order to find his case readily by means of the register, without introducing errors into the statistics of the diseases observed. My books are so arranged that only the new patients receive new, successive numbers, and those who, at the end of the year, remain under treatment are not entered again, nor such as return with a relapse of a disease for which they were treated in previous years. Furthermore, I beg to state that patients, not diseases, have been counted. If a patient suffered from two or more diseases in one or both ears, the diagnosis of the most important only was counted in the statistics.

---

* Read before the Medical Society of County of New York, February 24th, 1879.

I. Relative Frequency of Acute Otitis Media as to the Total Number of Ear Diseases.

During the last ten years I have treated in private practice 2,527 cases of ear disease, among which there were 182 of acute otorrhœa, *i. e.*, 7.2 per cent. In the hospital I have treated, in conjunction with the assistant surgeons (Pooley, Aub, Gruening, Gebser, C. Williams, Alt, Born, and others), during nine years, 6,102 ear patients, among whom 382, *i. e.*, 6.26 per cent., suffered from acute purulent otitis media. My private and clinical material of ear disease consequently amounted to 8,229 patients, among whom there were 564 cases of acute otorrhœa, which, therefore, represented 6.53 per cent. of the total number of ear diseases. In order to see how this agrees with the observations of others, I have compiled and arranged in the following table the statistics of some American and European aural clinics and surgeons that make special mention of otitis media purulenta acuta. The data which have served for the calculation, are stated in the subsequent references.

INSTITUTIONS OR SURGEONS.	YEARS.	Total number of Ear Patients.	Number of acute otorrhœa.	Percentage of otorrhœa to total number.
H. Knapp (private practice) . . .	1869–1878	2,527	182	7.2
N. Y. Ophthalmic and Aural Institute, 1 .	1869–1877	6,102	382	6.26
Dr. Roosa (private practice) 2 . . .	1869	500	15	3.00
" " " 3 . . .	1871	494	17	3.44
N. Y. Eye and Ear Infirmary, 4 . .	1874	2,439	77	2.91
" " " " 5 . .	1876	2,410	137	5.68
" " " " 6 . .	1877	2,679	99	3.69
Manhattan Eye and Ear Hospital, 7 . .	1869–1878	5,803	499	8.59
Brooklyn Eye and Ear Hospital, 8 . .	1876	874	76	8.69
Ear Department of the Philadelphia Dispensary (Dr. G. Strawbridge) 9 . . .	1870–1875	2,760	143	5.18
Dr. Spencer, 10	1873	255	29	11.37
" " 11	1872	166	9	5.42
Dr. C. H. Burnett, 12	1875	350	7	2.00
Total of American observations . . .		27,359	1,666	6.08
Prof. Schwartze (clinic)	1864–1871	1,406	116	8.25
Dr. Schalle (Military Hospital, Dresden) 14	1877	300	34	11.33
Dr. Hedinger, 15	1877	3,679	219	5.95
Dr. Poorten, 16	1874	1,040	38	3.65
Dr. Moos (clinic) 17	1864–1866	137	5	3.65
Total of European observations . .		6,562	416	6.27

Literary references to the foregoing table:

1. First to eighth Annual Reports.
2. Roosa: New York Med. Journ., Vol. V., page 514.
3. Roosa: Statistical Report of 494 cases of diseases of the ear. Am. Journ. Med. Sciences. No. 6, Bd. XXII., page 386.
4. Fifty-fourth Annual Report.
5. Fifty-sixth. " "
6. Fifty-seventh. " "
7. The next report, the MS. of which I was permitted to use by the kindness of Dr. C. R. Agnew.
8. Seventh Annual Report.
9. Report, 1876.
10. Statistical Report of 225 cases of diseases of the ear. Transactions of the Med. Assoc. of the State of Missouri, 1873.
11. St. Louis Med. and Surg. Journ., 1872.

12. Second Annual Report of the Philadelphia Infirmary for Diseases of the Ear, 1875.

13. Arch. f. Ohrenhlkde., Bd. I–VI.

14. Bericht über die Ohrenstation im Garnisonslazareth zu Dresden. Arch. f. Ohrenhlkde., Bd. XII, pag. 49 u. 50.

15. Mittheilungen aus der Ohrenpraxis. Würt ärztl. Corresp.-Bl., 1877, No. 6, 7 u. 8.

16. Mittheilungen aus der otiatrischen Praxis. Dorpater Med. Zeitschr., Bd. IV., Heft 2, 3 u. 4.

17. Anhang zum zweiten und dritten Jahresbericht der Augenklinik des Dr. H. Knapp zu Heidelberg.

In reviewing the preceding table, we find considerable variations in the statements of different observers and different institutions. These variations, however, become less marked the greater the material of observation. Acute otorrhœa seems to occur as frequently among the wealthy as among the poor, since private practice shows no essential difference from hospital practice. I should have liked to collect a greater number of German observations, but the statistical material was wanting. In the otherwise very detailed reports of Gruber, acute otorrhœa is not separated from chronic. These reports were consequently not available for the present purpose. This holds good also of Blake's reports of the Massachusetts Charitable Eye and Ear Infirmary.

What surprised me most, was the fact demonstrated by the preceding table, that the acute purulent inflammation of the middle ear occurs about as frequently in Europe as in America. The sum of all the European observations, as far as collected, shows almost the same percentage of acute otitis media purulenta, with reference to the whole number of ear diseases, that I have observed at my clinic in nearly an equal number of patients, the proportion being in both cases 6.27 per cent. The sum total of American observations, 27,350, furnishes 1,666 cases of acute otorrhœa, i. e., 6.08 per cent. This is even a somewhat smaller percentage than that derived from the sum total of European observations, 6,562 patients with 416 cases of acute otitis media purulenta, 6.27 per cent. The annual reports of the N. Y. Ophthalmic and Aural Institute contain specified classifications of all ear diseases. To enter into similar details as to private patients, would here be out of place, yet it may not be inappropriate to classify the cases of private practice in large groups, in order to show the statistical importance of acute purulent otitis media in comparison with the other ear diseases:

Diseases of the external ear	331	*i. e.*,	13.10	per cent.
Acute otitis media catarrhalis	206	"	8.15	"
Chronic " "	1,120	"	44.32	"
Acute " purulenta	182	"	7.20	"
Chronic " "	591	"	23.39	"
Diseases of the inner ear	99	"	3.84	"
Total	2,527	"	100.00	"

I have tabulated the clinical histories of the 182 cases of acute otitis media, to serve as a basis for the deductions of general results, which I shall illustrate by a number of typical cases, since space and your patience would not permit the reproduction of the entire tabular statement.

II. OCCURRENCE OF ACUTE OTORRHŒA, WITH REFERENCE 1st, TO THE AGE OF THE PATIENT; 2d, THE SEASON OF THE YEAR, AND 3d, ITS AFFECTING ONE OR BOTH EARS.

The influence of the age of the patient is illustrated by the following table:

AGE OF PATIENTS	NUMBER OF CASES.	PER CENT.
0–05	37	20.33
6–10	22	12.19
0–10	59	22.42
11–20	23	12.64
21–30	32	17.58
31–40	37	20.33
41–50	21	11.54
51–60	7	3.85
61–70	1	0.55
71–80	2	1.09
	182	

The table shows that the greatest contingent is furnished by the age of childhood, particularly the period from birth to the fifth year; next in relative frequency is the period from the 6th to the 10th year; then the age of the most robust manhood, from the 31st to the 40th year. It is evident that age alone does not suffice to form a correct estimate of the occurrence of a disease, but we have also to take into consideration the different obnoxious influences that are prevalent at certain ages. Childhood is in a more unfavorable condition than mature age, not only on account of the low power of resistance on the part of the youthful organism, but also on account of some important diseases predominantly inherent to it, above all, the acute exanthemata. In this respect our table falls short of representing the real frequency, since the acute affections of the ear, resulting from scarlet fever and other general diseases, generally do not come under the care of the specialist, or if they do, it is only when they have become chronic, and consequently lie outside the pale of our table.

2d. *The season of the year* furnishes the following results:

January . . .	21	patients.	July	9	patients.
February	25	"	August . . .	14	"
March . . .	14	"	September . . .	14	"
April	19	"	October . . .	4	"
May	20	"	November . . .	12	"
June	16	"	December . . .	18	"

This table shows that the winter months furnish a considerably larger number of acute suppurative inflammation of the middle ear than the summer months. I will here mention that the New York summer, that is the warm season, lasts from May 15th to November 15th. The warm months showed 69, that is 38 per cent.; the cold months 113, that is 62 per cent. of cases of acute otorrhœa. In places not situated near the ocean, the percentage is still more in favor of summer, on account of the absence of the dangers from sea-bathing.

3d. In regard to the one-sided or double-sided occurrence of the disease, the tabulated statement shows that both sides were affected with acute perforative inflammation of the middle ear in 26 cases, that is 14.29 per cent.; one side alone in 156 cases, that is 85.71 per cent. I should not omit to mention that in the great majority of cases both ears suffered, but perforation of the membrana tympani occurred in one only. The acute non-perforating inflammations of the middle ear have all been entered as acute aural catarrhs, and since only the number of diseased persons, and not of diseased ears, has been noted, a simultaneous milder disease of the other ear has not been included in the statistics.

III. ETIOLOGY.

The causes of acute suppurative inflammation of the middle ear, arranged according to their relative frequency, were the following:

Pharyngitis and rhino-pharyngitis	68 cases,	37.36	63.74 per cent.
Coryza and assignable exposure	48 "	26.37	
Sea-bathing	16 "	8.19	"
Scarlet fever	13 "	7.14	"
Diphtheria	4 "		
Measles	3 "		
Pneumonia	3 "		
Improper use of nasal douche	3 "		
Cold water and alcohol run into the ear	2 "		
Eczema of external ear	1 "		
Mumps	1 "		
Varioloid	1 "		
Causes unknown	19 "		

The first place, with 63.74 per cent., is occupied by the consequences of exposure to cold, manifesting themselves in inflammation of the naso-pharyngeal mucous membrane and its continuation into the middle ear, in the well-known manner. A part of the patients showed a constitutional predisposition, for instance scrofula, tuberculosis, syphilis, and the like. In others, acute naso-pharyngeal catarrh developed into acute purulent otitis media; in many others, the otorrhœa set in without any predisposing causes by the action of unfavorable physical conditions, as we see primary iritis or pneumonia occur. Exposure by standing in cold water, rapid cooling of the body, draughts during perspiration and sea voyages, were the most common causes of the primary purulent inflammation of the middle ear.

Sea-bathing enters with 8.78 per cent. into the etiological table. This number is not very high, if the manifold obnoxious influences connected with sea-bathing are taken into account. As such, I may specially mention:

1. *The local action of sea-water on the membrana tympani and the inner portion of the external auditory canal*, readily extending to the middle ear on account of the tenuity of the partition-wall and its vascular connection with the drum cavity.

Sea-water is injurious :

a. By its low temperature. "The ear suffers nothing cold," says the layman, and the aurist is familiar with the damaging effect of cold liquids that penetrate into the middle ear by way of the Eustachian tube or external meatus. Even without penetrating, but acting long and intensely upon the "door" of the middle ear—the membrana tympani—and its surroundings, cold liquids may bring about acute suppuration of the middle ear, as will be more conclusively shown hereafter.

b. By the large quantity of salt it contains, causing a direct irritation to the drum membrane and its adjacent parts.

c. By its impulse; the mechanical irritation of the membrana tympani and its surroundings causing congestion and swelling of tissue, according to the well-known "beating experiment" (Klopfversuch) of the skin. The inhabitants of places remote from the sea can hardly form an idea of the force with which the surf whips, stuns, and overthrows the bathers.

In Long Branch, for instance, one of the most popular sea-bathing resorts in the vicinity of New York, ropes are drawn from the shore into the ocean, and fastened to spiles to protect bathers from the dash of the surf. In spite of this, ladies and children seldom venture out into the water without the arm of a robust man.

d. By its contamination with fine sand, slime, small animals and plants. These substances are difficult to remove from the ear, and find a convenient lodging-place in the sinus between the lower portion of the membrana tympani and the adjacent part of the auditory canal, where they cause inflammatory irritation both by mechanical and chemical actions.

2. The prejudicial effect of the local action of sea-water is increased by some of the *physical properties of the ocean*

bath, acting on the system. For instance, the great loss of heat in the whole body, the damp and cold sea air, and the damp bed linen and covers, are apt to occasion inflammation of the middle ear, by the mediation of rhinopharyngitis.

Since sea-bathing in this way acts injuriously on the ear from within and without, it is but right that aurists should caution their patients against it. The occurrence of chronic aural catarrh, with thickening of the drum-head, in consequence of frequent bathing in the ocean, is mentioned by many aurists, and Dr. C. H. Burnett* illustrates it by the interesting remark, "that he is informed by a physician of the South, and it is a fact well known to others, that hunting dogs, taught to dive, become deaf."

If, in spite of what has been said, thousands of people each year enjoy sea-bathing with impunity, we have to see in this fact only an additional example of the well-established truth that every cause of disease produces actual illness only in a limited number of those who expose themselves to its action. With regard to the etiology of aural disease, I may be allowed to cite the high degree of immunity enjoyed by such persons as have passed through their youth without contracting any serious aural affections, provided that deafness be not hereditary in their families.

Scarlet fever is represented with 7.14 per cent. among the causes of acute purulent otitis media. This number is, as stated above, too low, but may be of some value as indicating the small proportion of cases in which the specialist is called upon to take charge of the acute stage of an ear disease which, on multitudes of people, inflicts life-long hardness of hearing, offensive discharge from the ear, frequent extension of the inflammation toward the brain, and, in some cases, death. To complain of this, and to make admonitory remarks, would here be out of place.

Diphtheria was observed in four cases, *i.e.*, almost two per cent., as the cause of acute otitis media purulenta. Since this cause is rather infrequent, I may be permitted briefly to report these cases.

---

* Treatise on the Ear. Philadelphia, 1877, p. 466.

The *first case* was that of an otherwise healthy boy, æt. 7, who had suffered from a moderately intense faucial diphtheria in May 1873, when the epidemic of diphtheria of the previous winter was in its decline. Two weeks after the beginning of the faucial diphtheria, ordinary aural catarrh developed on one side, but on the other acute otitis media, leading under the usual symptoms to perforation of the drumhead, set in on the third day. The perforation was small, and situated immediately below the umbo. Inflation was easy, and the perforation whistle distinct. The membrana tympani and the mucous membrane of the middle ear showed no diphtheritic appearance. The perforation in the drum membrane closed in two weeks, and, a few weeks after that, perfect recovery, with normal hearing, had taken place. The boy, whom I repeatedly saw some years after his recovery, has never again complained of his ears.

The *second case* was that of another child, æt. 2, who, in January, 1877, contracted scarlet fever, which was followed by diphtheritic pharyngitis, and, five days later, by perforation of the membrana tympani. I saw the child in consultation with the family physician. There was very intense swelling of the mucous membrane of the middle ear, without diphtheritic infiltration, furthermore, profuse otorrhœa, lasting six months. The disease ran a slow course, but the child finally recovered, the perforation in the drum membrane closed, and the hearing did not seem to be materially impaired.

The *third case* was that of a boy, æt. 5, who was brought to me once only, three weeks after the onset of the otorrhœa. While suffering from diphtheria of the pharynx, he had, for two days, most violent earache, followed by discharge, which had not yet diminished at the time of his presentation. There was a large defect in the drumhead, the mucous membrane of the drum was greatly swollen, bled easily, but was free from diphtheritic deposits.

The *fourth case* was that of a boy, æt. 6, who in January, 1878, had contracted a most intense diphtheria, which terminated fatally. The diphtheria commenced in the fauces, and caused extensive swelling of the walls of the whole bucco-pharyngeal cavity. In the right palatine arch there was a large abscess, which was opened by Dr. Cl. Wagner. The symptoms growing more alarming, the family physician called me in consultation, besides Dr. Wagner. I found the child speechless, in high fever, constantly moaning, and the walls of the pharyngeal cavity covered with white membranes, some of which were thrown out. The right facial nerve was paralyzed, the whole parotid region, the external ear, and the mastoid region, were hard and swollen. The external auditory meatus, on account of the swelling of its walls, was so much narrowed that the thinnest speculum could not be introduced. A flocculent serous discharge escaped from the external meatus. The eyelids were swollen, tight and red ; the conjunctiva was œdematous ; the eyeballs protruded considerably ; the refracting media were clear ; the retinal veins tortuous and dilated ; the margins of the optic disc ill defined ; the retina was swollen and grayish opaque (retinal œdema). The child died six hours after the consultation. Autopsy not permitted.

Only in the last of these four cases the diphtheritic process extended into the ear. The Eustachian tube may fairly be considered as having been its passage way. The extensive swelling of the neighboring parts, so frequently connected with severe diphtheria, was most marked in this case. Not only the regions of the mastoid process and parotis were involved, as is not uncommon in intense otitis, but also the cellular tissue of the orbit and eyelids. The inflammation may have reached these parts either by way of the spheno-maxillary fissure, or along the facial or jugular veins and the cavernous sinus. I purpose to discuss more in detail this quite extraordinary cause of exophthalmus in the *Archives of Ophthalmology* on another occasion. The presence of a truly diphtheritic process in the middle ear of the child was proven by the sero-flocculent character of the discharge, and the extensive diphtheritic infiltration of the soft parts of the mouth and pharynx. The characteristic stage of diphtheritis conjunctivæ is likewise distinguished by sero-flocculent secretion. As soon as the discharge turns creamy and purulent, and the mucous membrane bleeds readily, the disease has passed from the specifically diphtheritic into the blennorrhoic stage, affording an essentially more favorable prognosis. In the first three cases the blennorrhoic stage had already set in when they came under observation.

Measles and *pneumonia* furnished three cases, *i. e.*, 1.5 per cent.

The *inappropriate use of the nasal douche* produced acute suppurative otitis in three cases.

The *first* has been described by me in the *Archives of Opthalmology and Otology.*[*]

The *second* case was that of a gentleman of Chicago who came under my care in May, 1875. Though his case, as far as observed by me, does not properly belong to this series, his disease being an acute relapse of a previous affection, it is reported here on account of its instructiveness. Five years previously he had been treated for nasal catarrh by one of the most renowned German aurists with injections of solutions of nitrate of silver into the nose. During these injections the liquid happened to enter his left ear through the Eustachian tube, as was manifested by sudden, intense pain in the ear. The pain became more severe during the following two days, and the hearing impaired. The physician perforated the drum membrane, and purulent discharge set in. The patient's ear was treated for two years, but the acuteness of hearing was never so good as it had been before.

The *third* case was that of a lady of New York, æt. 20, who suffered from chronic nasal catarrh, but had never had any affection of the ear. She came under my treatment on May 7th, 1877. Four weeks previously, while she was using the nasal douche, cold water entered the right ear. This accident was immediately followed by sharp pain in the ear, which, however, gradually disappeared. Three days before she came to me, water had again entered the ear,and immediately caused intense pain, which subsided somewhat the next day, but returned with such violence during the following night that she came to me in great distress early the next morning. I found the membrana tympani red and bulging. Mucous râles on Politzer's experiment. I made paxacentesis of the drum, after which the pain at first increased, but subsided toward evening, when profuse purulent discharge of the ear set in. The acute inflammatory symptoms lasted some weeks ; the perforation of the membrana tympani closed on the 4th of July, and some weeks later her hearing was normal.

In chronic affections of the ear I have more frequently witnessed the injurious effect of water passing into the ear through the Eustachian tube. Only *cold* water produced severe symptoms, among which sudden intense pain was the most notable. In the majority of cases this pain disappeared in a few hours without leaving any consequences. A few times I had an opportunity to examine the membrana tympani under these conditions with an ear-mirror, and found it more or less uniformly red, as it is seen in acute aural catarrh or after prolonged syringing. In such cases I made Politzer's experiment, while the patient was bending his head forward. Some patients, accustomed to use Politzer's bag at home, resorted to the same expedient on their own accord. I have frequently seen mild and temporary symptoms of irritation to follow the entrance of liquid into the ear during the use of the nasal douche, but severe symptoms only in about half a dozen cases.

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[*] Vol. I, page 365–376. 1869.

In *one* case double-sided acute otorrhœa occurred in the course of *ophthalmo-blennorrhœa neonati.* This coincidence is neither rare nor unknown. I believe that the acute otorrhœa is caused by the cold water running, from the iced compresses applied to the eye, over the cheek into the ear.

In the case noted in our table, I could ascertain the entrance of the cold water into the ear, and, apart from this, there was in the otherwise healthy child, no other cause, of otorrhœa to be found.

Bearing in mind the injurious effect of cold water running into the ear, I warn not only the attendants of children, but all patients who apply cold water to the eyes, lest the water run into the ear. Besides this, I recommend them to put some cotton into the ears.

A similar case was that of a healthy clergyman, æt. 40, who had always had good ears. On July 10th, 1876, four weeks before he came to me, he had suffered intense headache, for which he had his head washed with *alcohol.* A small quantity ran into the right ear, and at once caused in it the sensation of cold and intense pain. The next day serous secretion from the ear set in, and grew gradually thicker. The pain lasted nine days. When he came to me he had ordinary purulent discharge from the ear and a perforation in the membrana tympani, easily recognizable by the mirror and the whistling sound on inflation. He recovered.

The history of this case seems clearly enough to demonstrate that the cold alcohol running into the ear caused first otitis externa, then myringitis, and at last perforative otitis media purulenta. In a similar way various inflammations of the external auditory canal lead to perforation of the membrana tympani and consecutive purulent otitis.

Eczema and *mumps*, also represented in our table, may belong to this category.

One case of *varioloid* produced otitis media acuta, probably by the mediation of naso-pharyngeal catarrh.

Lastly, there are mentioned nineteen cases without any assignable cause, be it that the cause could not be ascertained, or that I had omitted to note it.

Other cases in which perforation of the membrana tympani and otorrhœa set in after injuries, foreign bodies, old plugs of cerumen, and the diverse methods of removing them, further after circumscribed and diffuse otitis externa, have not been included in the table, since in these cases the inflammation of the middle ear was not primary but consecutive.

I do not purpose to dwell on the *whole symptomatology* of acute otitis media, lest this paper be too long. The *grave symptoms*: the external, causing periostitis of the mastoid process and meatus, as well as the internal, denoting the propagation of the inflammation to the cells of the mastoid process and the contents of the cranial cavity, are certainly of such importance that they should be critically reviewed on the basis of exact statistics, both with regard to their prognostic significance and their therapeutic indications. What do the intumescence and tenderness of the mastoid and superior cervical regions signify, and what indications do they furnish? What is the importance of the cerebral symptoms, the headache—which is rarely absent—the vertigo, nausea, vomiting, fainting, somnolence, fever, and the like? The statistics at hand are, however, not extensive enough to discuss these questions conclusively, since only a limited number of the cases were complicated with grave symptoms, but they are large enough to consider some other points, which appear not devoid of interest, namely, the beginning and duration of the otorrhœa and the termination of the disease.

IV. Beginning and duration of the otorrhœa.

The time of the beginning of the otorrhœa, expressed in days after the action of the cause, or after the appearance of the first pain, is shown in the following table. When both ears were running, only the one was noted in the statistics which first began to discharge:

Ottorhœa	began	after	1	day in	2	cases.
"	"	"	2	days in	48	"
"	"	"	3	"	53	"
"	"	"	4	"	15	"
"	"	"	5	"	7	"
"	"	"	6	"	10	"
"	"	"	7	"	15	"
"	"	"	8	"	3	"
"	"	"	9	"	1	case.
"	"	"	10	"	3	cases.
"	"	"	11	"	1	case.
"	"	"	12	"	1	"
"	"	"	14	"	7	cases.
"	"	"	17	"	1	case.
"	"	"	18	"	1	"
"	"	"	21	"	1	"

Time not stated in 13 cases.

The table shows, what is generally known, that the discharge from the ear in most cases sets in two or three days after the exposure, *i. e.*, after the beginning of the disease. These typical cases constitute over 50 per cent. of the whole number. The table shows further that the outbreak of the discharge, which coincides with the perforation of the membrana tympani, occurs still frequently enough from the fourth to the seventh day. By adding these cases (150 among 182) we find that in acute purulent otitis media the perforation of the membrana tympani occurs during the first week of the disease in 82 per cent. of the cases. Those in which the suppuration occurs in the second or the third week, may be considered as protracted, as transition forms from acute aural catarrh into acute otorrhœa. Among this category there are certainly many cases that under proper care would not have gone on to perforation of the membrana tympani. On the other hand, I am convinced that many a case which runs its course from beginning to end as acute aural catarrh, would manifest itself as acute purulent otitis if puncture of the membrana tympani were made. Severe symptoms of irritation, throbbing in the ear, redness and bulging of the membrane, mucous râles on inflation and the like, are cured in many cases without spontaneous or artificial perforation of the drumhead. The recovery in most of these cases is complete, and by no means protracted. Though in such cases the presence of pus in the drum cavity can be diagnosticated with the greatest probability, I have not included them in these statistics which contain only cases of acute *perforative* otitis media.

The duration of the suppuration, *i. e.*, of the purulent discharge from the ear, varied very considerably, as the following table shows:

The discharge lasted :

3 days in	3 cases.
5 "	5 "
6 "	2 "
7 "	8 "
8 "	2 "
9 "	1 case.
10 "	5 cases.
11 "	1 case.
12 "	1 "
13 "	1 "
14 "	17 cases.
16 "	1 case.
17 "	2 cases.
18 "	2 "
19 "	1 case.
3 weeks in	20 cases.
3½ "	2 "
4 "	20 "
5 weeks in	7 "
6 "	9 "
7 "	15 "
2 months in	13 "
2½ "	7 "
3 "	5 "
4 "	3 "
4½ "	1 case.
5 "	1 "
6 "	4 cases.
7 "	2 "
8 "	1 case.
2 years "	1 case.
Unknown or indefinitely long in	52 cases.
Terminating fatally in	4 cases.
Total,	208 cases.

The cessation of the otorrhœa does not always coincide with the closure of the perforation in the drum membrane, but precedes it considerably in many cases. Temporary cessation of the otorrhœa was not noted in the table, but only the permanent cure of the discharge.

The fifty-two cases of unknown duration comprise many in which the otorrhœa may have become chronic, but the majority of them refer to patients who were seen once or a few times only, whose recovery therefore was unknown. In the last table all perforated drum-heads were noted, and this is the reason that here the number of cases exceeds that of patients.

V. TERMINATION AND RESULTS.

The *termination* of acute otit. pur. is exhibited in the following table;

Perfect recovery, with good hearing, . .	118	cases, *i. e.*,	64.83	per. cent.
Discontinued treatment, when convalescent,	14	" "	7.69	"
Transition into chronic aural catarrh, . .	7	" "	3.85	"
Transition into chronic otorrhœa, . .	8	" "	4.39	"
Seen only once, ...	31	" "	17.03	"
Death, ...	4	" "	2.19	"
Total	182			

By recovery is meant permanent closure of the membrana tympani and removal of all inflammatory symptoms. Many patients had not yet enjoyed their full acuity of hearing, when the last note of their history was entered, but in many others this stage had been reached. PERMANENT AND COMPLETE CURE IS THE RULE—AT LEAST 80 PER CENT.—IN PRIMARY ACUTE OTITIS MEDIA PURULENTA. This result is demonstrated by the first category of cases, to which the majority of the second and fifth categories are to be added.

The four fatal cases deserve to be specially described.

H. K., a German hotel-keeper, æt. 53, of New York, consulted me on January 14th, 1870. His hearing had been good in both ears until three weeks previously, when, without assignable cause, headache, tinnitus, hardness of hearing, and pain in both ears occurred. Three or four days afterward the right ear began to run. From that time, copious purulent discharge from the ears, pain, occasional loud subjective noises, like the noise of a steamer. I found the patient very much depressed. With the right ear he could not hear the watch at all. Perforation whistle on Politzer's experiment. The mucous membrane of the drum cavity swollen, suppurating freely. In the left ear moderate catarrhal inflammation. Pharynx red and swollen. The severe inflammatory symptoms, the throbbing in the ear and copious discharge lasted three weeks. The inner portion of the external meatus was swollen, polypoid granulations were in the drum, the mastoid region was slightly red and swollen, the pulse was accelerated, and the patient complained of violent headache, vertigo, and great debility. I advised him to remain in bed, to put leeches behind his ear, ordered thorough cleansing of the ear and the instillation of an astringent solution. The granulations were removed with the polypus forceps. One day, when the discharge had ceased but the pain continued, I made an incision into the swollen skin of the meatus, and liberated a great quantity of matter. A deep and long incision, according to Wilde, was made over the mastoid process. The improvement began in the fourth week of treatment, *i. e.*, in the seventh of the disease, and progressed regularly in every respect. At the end of February he came to see me. He felt quite comfortable, being free from headache and vertigo. There was scant otorrhœa, but a large perforation of the drumhead, with moderate swelling of the mucous membrane in the drum. The region of the mastoid process was normal. I advised him to be cautious, to cleanse his ear, and present himself every three days.

Two days afterward, I was called to see him, and found his condition very much worse. He told me that, feeling so well on the day he went to me, he had paid visits to several of his business friends, and had taken a glass of liquor here and there. The following night his headache returned with increased violence; he had nausea and vomiting, his skin was hot, and his pulse accelerated. In consultation with his family physician, I ordered six leeches behind his ear, warm water into the ear every two or three hours, and cautious syringing. The cerebral symptoms rapidly increased in severity. When I saw him the next day, I found him apathetic. He had chills, facial paralysis, and was drowsy. The next day, he died in a comatose condition. Autopsy not permitted.

The *second case* was that of a consumptive man, 31 years of age, of New York, whose advanced constitutional disease had been complicated with acute discharge in the right ear two months before I was called to see him. Severe cerebral symptoms were present, but the region of the mastoid process was neither swollen, nor tender on pressure. From this reason, and considering the constitutional disease, I only advised cleansing of the ear with lukewarm water. Patient died a week afterward in a comatose state.

The *third case* was that of a decrepit man, 71 years of age, of

New York, who consulted me, August 24th, 1876, with intense earache and headache, and purulent discharge from the left ear, which had set in four days previously. With this ear he could not hear the watch at all ($h=o$), but understood speech at the distance of one foot ($v=\frac{1}{60}$) During the next three days ,the pain in the head and ear increased, and the walls of the external meatus were swollen ; pulse 120, temperature 99°, great debility. The discharge had ceased. He died on the first of September, eleven days after the beginning of the disease.

The *fourth case* has been described above. It is that of the fatal diphtheria of the pharynx and ear.

VI. TREATMENT.

In treating acute otitis purulenta, I have laid greater stress on the necessity of *rest* to the patient than is commonly done. Rest, if we want to secure *perfect restoration*, is as indispensable in acute inflammations of small organs as in that of large ones, where, *de facto*, it is a matter of necessity, not of choice. As I strongly advise patients with acute iritis or acute ophthalmoblennorrhœa to remain in bed and take care of nothing but their eyes, in order to recover the full enjoyment of perfect sight, and not expose themselves to the development of permanent synechiæ, opacities, and even the destruction of the visual organ,—in the same way I advise patients suffering from acute otorrhœa to remain in bed and take care of nothing but their ears, in order to reduce the action of the heart to a minimum, keep the whole skin equally warm and in an imperceptible, or, at times, in a low degree of perceptible perspiration. These conditions I consider, essential, if we want to cure an inflammatory affection readily, safely, and completely. As robust patients, are loath to relinquish their accustomed activity when suffering from inflammatory affections of small organs, it is the duty of the physician to call their attention to the consequences and dangers of an *incomplete* recovery. The oculist is commonly more readily obeyed than the aurist and the general practitioner. The practitioner, for instance, is in spite of all admonitions, in many cases unable to keep his gonorrhœa patients at home and in bed, which precaution, I am inclined to think, would obviate gleet and stricture more effectively than all general and topical remedies together. The more extensive my medical experience grows, the more importance I attach to the establishment of physiological sanitary conditions, in contradistinction to the remedies of the pharmacy, although I am no nihilist. In many cases of the disease under consideration I have most positively observed of what advantage rest, of what disadvantage unrest or imprudence is. Concerning the dangers of imprudence, I beg to recall the above-described case (page 18) of the German hotel-keeper, who, while convalescent from a severe otitis media purulenta, by visiting his friends and taking spirituous liquors, brought about a relapse, which terminated fatally in four days. On the other hand, I found that, when the patients remained at home and took good care of themselves, the perforation of the membrana tympani closed in the shortest time, and complete recovery was obtained. My ophthalmic practice, especially the operative, has forced the conviction upon me that rest in bed is of the greatest advantage in every acute inflammation of some importance. The same principles have guided me in the treatment of acute inflammations of the ear, and I cannot too warmly recommend them. To be sure, acute otorrhœa in otherwise healthy persons may disappear without particular precaution, in the same way as I saw a gentleman recover from a pneumonia which he had contracted in a snow-storm while travelling through the Rocky Mountains, but which did not deter him from continuing his four days' journey to New York. It would, however, be unpardonable if a physician were governed in his directions by such exceptional cases. All aurists warn us of the dangers of neglected otorrhœa, but they mostly dwell only on the necessity of local treatment.

At the head of the treatment of otitis media purulenta I would place the advice to consider the disease as an important and dangerous inflammation, and treat it with as much care and strictness as we treat pneumonia, iritis, and other acute inflammatory diseases. Let us remember only what the usual and less important consequences of neglected otitis are, viz.: chronic otorrhœa, chronic aural catarrh, thickening of the drum-head, adhesions between the different parts contained within the drum cavity—a life-long misery, which might have been prevented by one week's rest at home and in bed.

How fortunate the result of strict treatment in acute otitis media purulenta may be, and how happy we can make our patients, is exemplified by the following case, which is not taken from the series of those on which this paper is based.

October 25th, 1876, I was consulted by a gentleman residing in one of the most beautiful villas on the Hudson. He had his head wrapped up, suffered great pain, and could only with difficulty understand my speech. He stated that for years he had at times been somewhat hard of hearing, but for two or three days he had been almost completely deaf, and suffered violent pain in both ears. "Doctor," said he "can you cure me in two weeks?" I replied, "I will do my best; but why do you limit me to fourteen days?" "Because," said he, "I have made all arrangements to marry in two weeks, and, leaving these arrangements out of consideration, I would not like to lose much time, for I am sixty years of age." His drum-heads were red and swollen, and he had all the symptoms of acute otitis. Politzer's experiment improved his hearing immediately. I told him to return to his home, go to bed, put four leeches behind each ear, and pour warm water into the ears several times a day. When I went to see him the next day, his pain had subsided, and his right ear discharged. I kept him in bed, ordered thorough cleansing of his ears by gentle and repeated syringing, employed Politzer's experiment, and prescribed an astringent gargle. In the left ear no perforation occurred; the rupture in the right drum-head closed on the fifth day. On the sixth I allowed him to be up. His improvement advanced steadily. On the thirteenth day he paid me a visit. His drum-heads were red in their upper parts only; his acuteness of hearing was $V=\frac{20}{60}$, *i. e.*, speech was understood at the distance of twenty feet. On the evening of the fourteenth day he commenced his wedding journey, which I recommended him to extend not very far beyond the neighboring hills.—Never have I seen a more obedient, and scarcely ever a more grateful patient.

I may be brief with regard to the *local treatment,* since in this I did not materially depart from the customary methods. In the first days, before otorrhœa had set in, I had two to six leeches applied to the ear, filled the ear with warm water several times a day, and ordered an aperient. A number of patients, on their own accord or by advice of their physicians, had applied warm fomentations or poultices to the ear. I have examined these patients with particular attention, and find, in looking over my notes, that they all stated they obtained relief from such applications; I have not been able to convince myself, in any one of those cases, that the wet and warm applications had caused the suppuration to spread. This is heresy, I know, but fact, as far as it goes.

When the discharge suddenly diminished, and, at the same time, the pain in the ear and head returned, I found decided advantage from steaming the ear either with simple or, if the patient preferred, with aromatic water. This caused the ear to discharge again, and relieved the pain. I obtained the happiest results from steaming in some cases in which the cerebral symptoms were so marked that an opening of the mastoid process seemed justified, and I have seen so much benefit derived from this popular mode of treatment that I try it in every case, especially in chronic otorrhœa, in which the discharge suddenly ceases, and pain, vertigo, fever, and other symptoms, together with local inspection, prove that the inflammation has not subsided but rather become more intense. In the majority of cases steaming brings the discharge on again, sometimes attended with the liberation of copious, cheesy, offensive masses. If steaming and leeching do not reduce the inflammation, operative treatment should not be delayed.

The greatest attention was paid, of course, to the condition of the *naso-pharyngeal cavity and the Eustachian tubes.* In recent cases, Priessnitz's applications to the neck were ordered. The naso-pharyngeal cavity was always treated with astringent solutions (nitrate of silver, alum, tannin, sulphate of zinc, etc., one to three per cent.), either in the shape of gargles and nose waters, or by means of a nebulizer or a posterior naves syringe. The use of the nasal douche, however, has been avoided.

In all cases of otitis media that are complicated with swelling of the mucous membrane of the Eustachian tubes, I use astringent injections by means of the catheter. I take care that the quantity of the injected liquid does not exceed a few drops, and compress the bag with moderate force only, so that the liquid exhausts itself in the inner and isthmus portions of the tube, for I have always found that cold liquid entering the drum cavity acted injuriously. Furthermore, I have not yet been able to satisfy myself of the utility of injections of warm liquids, which, at any rate, are only employed in chronic affections of the ear.

Inflation of the ear, either by Politzer's method or with the catheter, was practised in all cases ; its beneficial effect is generally recognized, and Moos (Klinik der Ohrenkrankheiten, page 120) ascribes to Politzer's method even a fundamentally beneficial influence on the closure of the perforations of the drum-head. Though I am convinced of the appropriateness of inflation, I find in my statistics, besides many cases in which inflation according to Politzer immediately improved the hearing, some cases in which, if employed in the initial stage of the disease, it caused pain and temporary diminution of hearing. It is not impossible that the current of air forces mucus and pus from the tube into the drum, and from the drum into the mastoid cells. I am therefore very cautious in inflating the ear during the acute stage of inflammation, and always use the catheter first, together with the auscultation tube. I begin the inflation with slight pressure, increasing it gradually, while I listen through the auscultation tube. By this method one can judge better of the resistances in the tube, and the contents of the drum cavity, than by Politzer's experiment. It frequently happened that the first puffs of air through the catheter produced mucous râles, but then the air entered in a clear and unobstructed stream. The improvement of hearing was in most cases only moderate, but when, immediately afterward, Politzer's experiment was vigorously performed, the acuteness of hearing was considerably increased. I think that every aurist will bear me out in asserting as the result of my experience, that Politzer's method, in general, produces a greater immediate improvement of the acuteness of hearing than catheterism. If both methods are employed immediately after each other, we should, however, be careful, lest the cumulation of the effect be injurious (Moos). Inflation, in my opinion, is more important in the secondary (catarrhal), than in the acute (suppurative) stage.

I have seldom resorted to the *paracentesis* of the membrana tympani. Though the puncture of the drum-head be a simple and harmless procedure, I use it not without a certain reluctance, probably owing to the poor results commonly obtained by paracentesis of the anterior chamber. I have practised paracentesis of the drum only when the indications (pain, mucous râles, bulging of the membrane, etc.) were clearly pronounced. It afforded relief only when it liberated pus, and was immediately followed by otorrhœa; otherwise it increased the pain, which only subsided when, later on, suppuration set in. Much has been written about the paracentesis of the drum cavity. In the present phase of otology, this operation has become "fashionable," yet there was a time—and it has not long passed by —in which it was declared a sin of omission not to puncture the cornea when hypopyon was present. To-day no oculist performs paracentesis of the anterior chamber for the sake of removing pus, for it is known that pus in the anterior chamber is most rapidly absorbed as soon as its source has been removed. I am loath to apply conclusions by analogy from one organ to the other, but I confess that the present popularity of paracentesis of the drum cavity has not induced me to perform this operation at every opportunity.

Wilde's incision over the mastoid process was often practised, and commonly afforded relief.

Opening of the mastoid process was never resorted to in the series of cases under consideration. Of this operation also I am not a great admirer, and perform it only when the cerebral symptoms are threatening, especially when, at the same time, the secretion has ceased more or less suddenly, the mastoid region is red, swollen, and tender on pressure *i. e.*, in cases that show some probability of retention of morbid substances in the cells of the mastoid process.

I lay great stress on *careful cleansing* of the ear. This should be done by syringing with lukewarm water, to which a small quantity of table salt or soda may be added. In the later stage, however, the ear canal may be wiped with a cotton plug wound around a dentist's cotton holder, which, if I am not mistaken, Dr. Holcomb, of New York, has introduced into aural practice.

When the discharge continued for some length of time, *weak astringent solutions* were instilled into the ear. If such instillations were made at an early stage, or with stronger solutions, for instance nitrate of silver, 2–5 per cent., they, without exception, increased the inflammation and the pain. I have been led to do this several times, five to ten years ago, when the application of strong remedies to the middle ear was loudly praised on both sides of the Atlantic. I know that these praised applications refer chiefly to chronic otorrhœa, yet I am perhaps not the only physician who was tempted to try them also in the acute stage of suppurative inflammations, where they are, as I have convinced myself, just as inappropriate as in the primary stage of inflammation of the conjunctiva.

Polypoid granulations were several times observed to form in the course of acute otitis media purulenta, but scarcely ever required operative treatment. If the ear is thorougly cleansed, and the mucous membrane of the naso-pharyngeal and tympanic cavities rationally treated, granulations in the tympanic cavity, when formed during acute inflammations, commonly disappear.

Collections of matter in the walls of the meatus and the surroundings of the ear, were noticed in several instances, and without delay removed by incisions.

ON THE FORMATION OF SEQUESTRA IN THE MASTOID PROCESS OF THE CHILD.

By DR. ARTHUR HARTMANN, of Berlin.

Translated by Dr. James A. Spalding, Portland, Maine.

ANATOMY.

THE anatomical relations of the mastoid process in newborn children, and in the earliest years of life, have been most clearly described in the valuable works of Schwartze and Eysell,* and by Wildermuth.† The cavity which develops itself later into an air-containing system of cells in the mastoid process, and to which Wildermuth, very pertinently, gives the special name of antrum petrosum, is even in new-born children of considerable size, and exhibits the shape of a triangular pyramid (Schwartze), one of whose surfaces, directed upward, is formed by the continuation of the roof of the tympanum. According to Schwartze, the cavity is 8 *mm.* long, 7 *mm.* high; according to Wildermuth, 9 *mm.* long, 5 *mm.* high. The antrum changes in the earliest years of life, in that it increases in size, and undergoes a change in shape. Its form by this time resembles that of a nine-pin, with its base turned upward (Wildermuth), whose height measures 8–9 *mm.*, and the length of its base 1 *cm.* (towards the end of the first year of life). The increase in volume of the antrum petrosum takes place, not only through the growth of all the osseous parts enclosing the cavity, but also through an absorption of the walls from the inner surface outward, which occurs especially in a downward and backward direction. I have already called attention to the fact, that in twenty-one sections of the temporal bone in children, I found the average thickness of the bony wall between the antrum and the posterior fossa of the cranium to be 4 *mm.*, while in twelve temporal bones of children, at the age of 1–5, the antrum was separated from the posterior fossa of the cranium by a bony wall that averaged but 2 *mm.* in thickness, and in five cases by a bony lamella that was scarcely 1 *mm.* thick. Basing my opinion upon these measurements, I expressed myself thus, as regards the origin of the cells: "Since the cavity is again found smaller in later years, this can only happen by a narrowing from the sides, that is to say, by an encroachment of the partition walls of the cells." * The first trace of the formation of the air-containing cells is found in the newly-born; on the one hand, small ridges arising above the surface, show themselves at the posterior and upper angle of the antrum, which is formed by the petrous bone; and on the other hand, at the anterior and outer surface, which belongs to the squamous portion, and which, at the latter part, frequently show a fan-shaped arrangement. In the course of their further development, it is especially those ridges projecting from the squamous portion, and bound together by a lattice-work which encroaches upon the cavity, and finally unite in a fan-shaped arrangement with the opposite wall of the petrous bone. From a larger series, now lying before me, of sections through the mastoid process of the temporal bones of children, especially during the third, fourth, and fifth years of life, there is found, depending upon the age, only a framework of close meshes on the squamous portion, which is united with the petrous bone with scarcely any mesh work, and then again, in older children, the bonds of union are much more numerous, and there is frequently no fan-like arrangement. While at first, there is still an empty cavity, which extends from its opening into the tympanum to the posterior wall of the antrum, at a later stage it is first divided longitudinally by the development of a bony framework into several compartments, then by further division, and by the development of partition walls in an oblique direction, the air containing spaces of the mastoid process of adults are originated. Together with the development of the framework, there is, besides, a simultaneous enlargement of the collective space of the cavity, especially towards the mastoid process, which develops itself from the time of birth onward, by a conversion of the cancellous bone into air-cavities. Of the original cavity, standing in direct union with the tympanum, there remains only the part designated as the antrum mastoideum, which communicates with the tympanum by the approach to the antrum mastoideum. In spite of the great variations shown in isolated preparations from individuals of the same period of life, we are able, by comparing a large number of specimens, to demonstrate the process of development as just described.

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* Ueber die künstliche Eröffnung des Warzenfortsatzes. Archiv für Ohrenheilk. Band VII.

† Die lufthaltigen Nebenräume des Mittelohres beim Menschen. Zeitschrift f. Anat. u. Entwickelungsgesch. Band II.

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* Ueber die Perforation des Warzenfortsatzes; v. Langenbeck's Archiv.; Bd. XXI.

The air-cells of the mastoid process, and especially those which lie behind and below it, open into the antrum mastoideum of adults, while those situated sideways open also in part towards the antrum, or directly into the entrance to it. In many cases also in adults, we can demonstrate the radiating arrangement of the cells, to which Schwartze and Eysell first directed attention, since we find nine-pin shaped spaces, the points of which are directed towards the antrum mastoideum, that is towards its entrance and towards the tympanum.

While according to the common opinion the development of these cell-cavities takes place in this way, viz., that up to the time of puberty the cancellous bone undergoes rarefaction, after which only the partition walls of the cells remain, I became convinced by the results of my measurements that this sort of cell-development plays a subordinate *rôle*, since the collective space of the cavity first enlarges itself, and then the cell-system develops itself by the new formation of partition walls. If the growth of the cells did not take place, the original cavity must likewise undergo an increase of volume, just as the capacity of the cranium becomes enlarged by the growth of its bony capsule. There are great variations to be found in individuals; if either the one or the other process has remained in a backward state, at one time there is a preponderance of the enlargement of the collective space of the cavity, and then again of the development of the framework, enclosing the pneumatic spaces.

I was able, by the results of my measurements, to convince myself as already mentioned, that this process of development just described must take place, since I found that the expansion of the antrum petrosum, was subsequently developed into the cell-system, so considerable in new-born children, and in the first years of life, that it was equal, not only relatively, but even absolutely, to the size of the antrum mastoideum in adults, and in many cases even surpassed it. Later there must be a diminution, which could take place only by a formation of cells from the walls. Moreover, this mode of development seemed to me very probable, since in isolated cases in adults I found the lateral wall of the antrum mastoideum formed by osseous plates, which showed no openings from cells, since the cells situated at the side did not open towards the antrum, but towards the approach and the tympanum. In these cases there could be no question of an extension (in the shape of diverticula) of the mucous membrane from the antrum as middle point. In that case I have already called attention to the fact, that the larger pneumatic cavities of the mastoid process do not communicate directly with the antrum mastoideum, but only by small openings with the neighboring cellular spaces, which seems to me to be against a development starting out from a previously formed antrum.

The petro-squamous suture runs longitudinally through the middle of the roof of the original antrum petrosum, and extends backward and outward to the incisura parietalis; from that it closes as the mastoideo-squamous suture upon the outer surface of the mastoid process, runs from in front downward to the posterior wall of the auditory meatus, and from here returns upward again to the tympanum. The pyramid is thus separated from the squamous portion of the temporal bone, and can be easily separated in the macerated temporal bones of new-born children. The ossification of the suture makes rapid advances even in the course of the first years of life, and the mastoideo-squamous suture especially, is found completely ossified at a very early period. While the petro-squamous suture always shows traces of itself on the floor of the middle cranial fossa, and is easy to recognize even at advanced periods of life, there are no traces whatever of the mastoideo-squamous suture in the majority of cases of older individuals. It is only exceptionally that we find a few grooves and furrows on the outer surface of the mastoid process, which have remained as vestiges of the former suture (Gruber).

PATHOLOGICAL ANATOMY.

The arrangement and nature of the cell-cavities, as well as the relation of the sutures in the mastoid process of the child, play an important *rôle* in a practical point of view. The inflammatory process spreads from the tympanum and antrum petrosum to the neighboring regions, much more easily before the ossification, especially of the petro-squamous suture, than at a later period of life. There are cases in which meningitic symptoms arise in a new-born child, a few days after the appearance of an otorrhœa, and end fatally. The older the child, the less is the danger of the consecutive cerebral affection. Toynbee rightly calls attention to the fact, that up to the second or third year of life, the cerebrum is most frequently affected, corresponding to the anatomical relations, while affections of the cerebellum and of the transverse sinus appear only at a later age.

The secretions, however, which collect in the antrum, gain an exit to the outer surface much more frequently than to the interior of the skull, since they lead to destruction, or chipping of the external wall by necrosis, and to the formation of abscess under the investing skin. The universal opinion is that the preformed paths, and the boundaries for these processes, are especially constituted by the sutures, since it is assumed, that the secretions escape outward through the sutures, and that the processes of necrosis are bounded by them. Bezold,* especially, speaks most in detail upon this method of propagation of the morbid process, since he assumes, that when the formation of abscess behind the ear ensues in the course of purulent inflammation of the tympanum, lasting for months or years, the collection of secretion in the antrum makes its exit along the mastoideo-squamous suture. Although this may be more frequently the path, especially in the first years of life, I could not help believing, after more accurate examination of a large number of macerated temporal bones at the age of childhood, that the way through the squamous portion is really much nearer and more favorable than through the mastoideo-squamous suture. I have, on the one hand, just called attention to the fact that the ossification of the suture comes on, as a rule, at a very early age; on the other hand, the cells of the squamous portion, for the most part, approach very near the surface, so that from here the propagation of the inflammatory process could follow more easily than through the suture. Practical experience shows that, when the abscess which has formed behind and beneath the auricle, is incised, there are, as a rule, already present, sometimes larger and sometimes smaller, openings into the outer wall of the antrum. It is not possible to decide from the observations and experiences before us, whether or not the mastoideo-squamous suture plays an important part in the origination of these openings. If we syringe through such an opening, the fluid escapes by the external auditory meatus. Still rarer are those instances where such a communication is not present, in which case we may suspect that we have to do with a periostitis of the external surface of the bone, without direct transmission from the antrum outward.

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* Erkrankungen des Warzentheiles. Archiv. f. Ohrenheilkunde. Bd. XIII.

Thus, in the course of a very violent purulent inflammation of the middle ear after scarlet fever, I saw the formation of an abscess behind the ear of a boy four years old. When I made the incision, the surface of the mastoid process was found to be separated for a considerable extent from its periosteum. There was no communication with the antrum and the tympanum. A drainage tube was inserted. It was removed on the second day, and the antiseptic bandage applied. The walls of the abscess had again united by first intention, and a perfect cure soon followed.

It may happen, moreover, that the abscess has originally a communication with the middle ear, which again closes. The following case, which lately came under my care, might be reckoned in this class:

This was the case of a boy three years old, who, when six months old, without any other disease, had an otorrhœa in his right ear; at the age of eighteen months, an abscess formed behind the ear, which, however, did not open outward, but probably through the antrum towards the tympanum, since one day, when the growth behind his ear decreased in size, a large amount of pus suddenly escaped from the external auditory meatus. Fistulous openings outward formed themselves later behind the auricle, through which a secretion discharged constantly, although sparely; the secretion from the external meatus was slight. After chloroform had been administered, I made an incision at the insertion of the auricle, at which point one of the two fistulæ was. This incision was joined to the second fistulous opening, lying further behind, by an incision made perpendicular to the first. The surface of the mastoid process showed itself to be carious, and small carious patches reaching to the depth of ½ *cm.* were removed with the sharp spoon. As the bone showed itself healthy at a greater depth, nothing further was done in the way of digging deeper. In the course of the cure, some small osseous particles were thrown off; perfect cicatrization occurred.

When those particles of bone are thrown off by necrosis, we cannot precisely say from the examination of the contours of the sequestrum, from which part of the original bone it is formed, nor whether its expanse is bounded by one of the sutures or not. Two sequestra in my collection go to prove that the line of demarcation does not always coincide with the suture. I extracted these specimens from a child, the course of whose disease will be described more in detail under Case No. 3. In both sequestra which belonged to the roof of the antrum, the complete ossification of the petro-squamous suture is demonstrable, so that indeed the suture has played no *rôle* in the propagation of the process.

The inner portion of the mastoid process, especially the distribution of the cells, seems to have greater influence than the sutures upon the development and expansion of the diseases of the bones. The inflammations of the middle ear, so frequent in childhood, extend also as a rule upon the mastoid process, and may here give rise to diseases of the bone. Although indeed the hidden situation of the antrum favors on the whole the deposition and collection of secretions, and the advent of processes of decomposition, this is still more the case by the small air-cavities in the antrum. While in adults the larger cell-cavities as a rule are protected against a direct transmission of the inflammatory process to the mucous membrane, since, as we have seen, they do not communicate directly, but by small openings with the neighboring cells, and these again in the same way with the antrum, the inflammatory process in children can encroach directly upon the lining membrane of these cavities, which are still in process of development. Hence caries and necrosis in the mastoid process frequently ensues, and especially of the framework which projects from the squamous portion of the surface of the mastoid process towards the cavity, and which has the finest mesh-work in that part which is turned towards the outer surface.

SYMPTOMS AND COURSE.

The cases of carious processes and formation of sequestra in the mastoid process of children, a great number of which have come under my care, had this in common, that large masses of purulent secretion were removed from the external auditory meatus. In most cases this secretion lasted for months or years, began usually without violent inflammatory processes, slight at first, and gradually growing more considerable. While the secretion at first had a muco-purulent character, it acquired later the real purulent, offensive nature. It consequently seems that this is the usual process; the mucous membrane covering the cell-spaces is destroyed by the decomposition of the secretion produced, caries develops itself, and necrosis follows, for sometimes smaller, and now again larger portions of the mastoid process are chipped off. Precisely the framework of the cells most frequently becomes necrotic, and either smaller sequestra are formed, which can be thrown off through the external meatus, or they are of more considerable size, embracing the whole thickness of the wall of the antrum, since they extend as far as the outer surface to the auditory meatus, or to the lower surface of the cranium; these sequestra can be removed only by an operation. Granulations appear with the formation of the sequestra, and in their turn give rise to an increase of the secretion. The sequestrum may be pressed by the granulations towards the tympanum, and from there urged outward (an occurrence to which Bezold has especially called attention). The bottom of the external auditory meatus is found as a rule filled with granulations; if these are removed, the exit of the sequestrum is facilitated, or it can be removed artificially. In how far resorption can ensue, especially in the case of small sequestra which are imbedded in the granulations, remains undecided.

During the course of the disease an abscess frequently forms behind the auricle, which is pushed forward and outward, and fluctuation is soon discoverable. The swelling may become very considerable, extending upward to the surface of the squamous portion, backward to the occiput, and downward along the side of the neck. It happens sometimes that the abscess evacuates itself inwards, resp. through the external auditory meatus; if this is not the case, it opens outward, unless we interfere operatively. When the incision is made the periosteum is found lifted for a considerable expanse from the underlying bone, and sometimes granulations have pushed themselves between the skin and bone, especially when the process has lasted a long time. The probe almost always shows an opening of varying circumference leading into the antrum. If this opening is enlarged with the sharp spoon or chisel, the antrum is found, filled with granulations, beneath which lies carious bone, or one or more sequestra are imbedded.

The origin of the formation of abscess behind the ear is in most cases caused by the hindrance of the flow of the secretion from the ext. aud. meat., since the granulations plug the inner end of the meatus, and the secretion accumulates in the antrum. As a result of the carious destruction which has already ensued in the course of the disease, and which most frequently affects directly the external wall of the antrum, the purulent collection may propagate itself towards the outer surface, here cause inflammation and lead to extensive detachment of the periosteum from the underlying surface of the bone.

CASES.

The following cases may serve to illustrate the various incidents of the disease:

First Case.—Purulent otorrhœa lasting for 1¼ years. Formation of abscess behind the right ear; removal of a large sequestrum: Cure.

Since I have already described this case,* I confine myself to drawing attention to the important points, in reference to the morbid processes just depicted.

After a girl, 3 years old, had suffered for more than a year from a very abundant and offensive discharge from the right ear, an extensive formation of pus ensued behind the auricle, with a violent inflammation of the surrounding tissue. Slight pressure upon the abscess evacuated its contents through the external auditory meatus, and the cavity could be cleansed by syringing into the meatus. On account of a sequestrum which was found in the tympanum, an operation was decided upon, after the inflammatory symptoms had abated. The operation could not be finished on account of dangerous narcosis from chloroform, and only an incision was made at the insertion line of the auricle.

The surface of the squamous portion was found denuded of periosteum at a spot as large as a cent, and was covered with dirty-looking granulations which were removed with the sharp spoon. When the operation was repeated, the skin seemed again united with the underlying bone. The opening in the bone was enlarged with the sharp spoon. The track of the incision was enlarged upward and downward by a curved sound pushed forward into the tympanum, so that the auricle could be drawn off and forward from its base, and the sequestrum felt with the tip of the finger in the tympanum. Since the surface of the antrum as far as the tympanum was found to be destroyed, the removal of the sequestrum after a vain attempt with the forceps, was accomplished with the sharp spoon, by means of which it was pried out, without especial difficulty. It had a triangular pyramidal shape; its greatest length being 13 *mms.*, height and breath 10 *mms.* After the wound had been kept open by drainage tubes for three weeks, and two small sequestra which were loosened with the sound had been removed, a cure followed in five weeks after the operation.

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* Entfernung eines grossen Sequesters aus der Paukenhöhle eines Kindes Von Dr. A. Hartmann, *Deutsche Med. Wochenschrift*, No. 43, 1877.

The auricle required about the same position as upon the healthy side, and the secretion which had been so considerable before the operation, ceased completely. At present I see the child every three months, and find it necessary to remove with the syringe and probe a few thickened membranous masses, from the tympanum.

Second Case.—Formation of sequestra in the left mastoid process: Operation. Death six weeks after the operation.

Arthur Mohn, 1½ years old, came under my care April 27th, 1878. His parents were healthy, but an older brother suffered from a scrofulous disease. The history of the case shows that an otorrhœa began in the left ear at the age of six months, after the child had appeared restless for a few days, but without more violent inflammatory symptoms. The discharge from the ear was from the first very abundant, now somewhat less, again greater; always yellow, purulent and offensive. A keratitis began simultaneously with the discharge from the ear, healed, and left an extensive cloudiness of the cornea, and moreover, the retro-maxillary glands had been sometimes swollen.

The examination of April 27th showed the patient of pallid skin, moderately fat; bodily functions normal. There was an offensive serous discharge from the left external meatus, after the removal of which, granulations were seen at the bottom the meatus which completely filled it. A larger part of these were at once removed by the snare, and a further amount on the next day. The region of the mastoid process behind the ear was painful on pressure, and slightly reddened.

The inflammation extended over the mastoid process during the next few days, in spite of the removal of the granulations in the external meatus; the swelling became more considerable, and the auricle was pressed a little forward and outward. Fluctuation appeared on May 2nd, so that an incision was made. A coffee-spoonful of thick offensive pus at once flowed out. When the solution of carbolic acid was syringed into the opening made by the incision, it flowed out from the ext. meatus. A drainage tube was put into the opening. Rough bone was felt in the mastoid process with the probe, but its mobility could not be demonstrated. The subsequent treatment consisted in regular cleansing with a weak solution of carbolic acid, and granulations in the ext. meatus which formed again and again, had repeatedly to be removed. While the swelling behind the ear diminished quickly, there was still an abundant, purulent secretion, especially from the wound. In the second week in June, swelling appeared in front of the external ear, since the tragus, and the anterior region of the ear began to inflame, and the skin became red, hot, and tense. On account of the approach of these new complications, I found myself compelled to take the child into the Moabit barrack hospital.

June 18th, under chloroform, the fistulous opening originating from the previous incision was enlarged upwards and downward by incisions in the insertion line of the auricle, the edges of the wound were held apart with sharp hooks. After the hemorrhage had been stopped, the outer wall of the antrum petrosum was found to be perforated by an opening as large as a bean, and behind it were granulations. The softened edge of the opening was enlarged with the sharp spoon, which was accomplished without using force. The granulations were scraped out, together with a few particles of necrosed bone. Since the hemorrhage was very slight, the field of operation could be continually kept clearly in sight. I could see in the lower part of the antrum, a considerable piece of bone, which on pressure with the sound showed itself slightly movable, and could then be pried out with a sharp spoon, and removed with the pincers. A thick drainage tube was laid into the wound which was covered with salicylic wadding. The sequestrum which had been removed, and which consisted of porous bone soaked through with purulent and partly thickened secretion, measured 10 *mm.* on its longest side, while its greatest breadth was 9 *mm.*, and its thickness 5 *mm.* Since the operation had been free from all complications, and the comparatively slight interference could be made in the most careful way with a full view of the parts, and without the use of force, I believed that there could be no doubt of a favorable result.

The after treatment consisted in removal of the bandage twice daily, and syringing with a two per cent. solution of carbolic acid. On the second day after the operation, the temperature first began to increase: Evening 38.4 (Cent.), on the third day 37.8, fourth day 38.2, while on the following days it returned to normal. The secretion after the operation was decidedly less, the wound began to grow clean, and granulations to form. Two small sequestra could be loosened with the probe, and were removed with the syringe. On the ninth day after the operation, diarrhœa set in together with loss of appetite and increase of feverishness to 39.0 at evening, which repeated itself on the following days to 39.6, with a return to normal every morning. The wound began to look unhealthy with the return of feverishness, and the region around the wound grew red and moderately swollen. A small abcess formed close behind the ear in the following day ; it was incised, and a second one followed on the side of the neck which likewise had to be opened. The temperature became normal, when this inflammation decreased. The neighborhood of the wound remained slightly reddened, and the track of the wound showed no tendency to heal. Diarrhœa and loss of appetite continued, and were but slightly improved by the most careful nourishment and the medicines exhibited.

July 19th, the patient was discharged from the hospital, at the wish of his parents. A relapse followed after temporary improvement of the symptoms on the part of the digestive organs.

On the evening of July 28th, convulsions followed, and from the exact account of the parents, only of the right side of the body, since both the little arm and the leg fell into clonic convulsions. On that night and the following day convulsions appeared in the rest of the body. Death in a comatose state.

The section was not allowed, and I could only convince myself with the probe that there was no communication from the cavity in the mastoid process towards the interior of the cranium.

REMARKS.

It is difficult to decide how it happened in spite of the very favorable course of the operation itself, and the antiseptic after-treatment, that the result was fatal. Since we were obliged to operate during the inflammatory stage, it seems probable to me that just as the resorption of inflammatory products had occasioned the formation of abscess in the neck, and also the subsequent fever, by this same process inflammatory deposits in the cranial cavity were produced, and were the cause of the fatal result. It seems to me that local depositions must have taken place on account of the appearance of unilateral convulsions which preceded death. Unfortunately this view could not be proved by an autopsy.

Third Case.—Formation of numerous sequestra on both sides, especially from the roof of the tympanum and the antrum petrosum; death eight months after the operation; abscess of the brain.

Paul Braun, æt. 2, came under my care December 1st, 1877. The father suffers from chronic bronchial catarrh, with a phthisical appearance; the mother is healthy. The father carries on his trade of cigar-making in the common family sitting-room. The patient, as we learn, recovered from an inflammation of the lungs at the age of six months. The discharge from both ears began at the age of 1¼ years, without any especial inflammatory symptoms; the secretion was purulent from the first, now less, now more abundant, never ceasing entirely, and always offensive. The child was poorly developed since birth. Its nights were very restless; it usually took no interest in things going on, made no attempts to walk, but had always a good appetite. It had been treated previously with instillations of zinc-solution. Four weeks before the child came under my care, the parents noticed for the first time behind the left ear a swelling which enlarged slowly.

Present state.—The child has a sickly appearance, the skin is flabby and anæmic, the superficial veins, especially on the neck, are very full, and of a bluish look; meagreness of flesh. There is a very extensive secretion from both ears, of dirty yellow, offensive pus, after the removal of which granulations are seen at the bottom of the external auditory meatus. While the neighborhood of the right auricle is sound, there is a swelling as large as a dollar behind the left ear, without inflammatory appearances on the skin which covers it, and there is a spot of fluctuation close behind the ear. This is incised, when but slight discharge follows; the fluid syringed in flows from the meatus, and towards the nose; the sound touches rough and seemingly movable pieces of bone. The granulations which grow luxuriantly from the tympana towards the external meatus are removed with the snare. Dec. 11th, on syringing, a small sequestrum is removed from the right ear. The secretion continues very excessive, so that a thick bandage, morning and evening, is wet through.

In spite of the unfavorable bodily health of the child, I made up my mind, although there seemed to be but very slight hope of success, to check the excessive secretion by removing the sequestrum, and so to bring the child into a better state of development. For this purpose I had him transfered to the Moabit Hospital. December 16th, under chloroform, the opening already existing on the left side was enlarged upward and downward, and the dirty-looking granulations under the skin were removed with the sharp spoon. The outer wall of the antrum was found extensively destroyed, and several smaller particles of bone, together with the granulations in which they were imbedded, were removed from the antrum. The incision-wound was kept open by a thick drainage tube; salicylic bandage; syringing twice a day with a two per cent. solution of carbolic acid. The canal of the wound, kept open by the drainage tube, was so wide, that when the tube was removed, the antrum could be nicely overlooked with the reflector, and in the following days, under control of the eye, a few more small sequestra could be loosened with the sound and extracted. December 23d, a large sequestrum was removed in this way with the bent forceps, and on December 25th, a second of about the same dimensions. The first was 15 *mm.* long, its greatest breadth 10 *mm.*, and its thickness 5 *mm.*; its form was very irregular. The second sequestrum represented a thin plate, the roof of the antrum; its greatest length, 15 *mm.*; greatest breadth, 9 *mm.* The upper surface appeared smooth, and the suture, corresponding to the petro-squamous fissure, ran along it longitudinally. The surface of the sequestrum turned towards the cavity of the cranium, was covered with pus and small scales of thickened, cheesy secretion, so that a purulent process must have existed for a long time previously, between the dura mater and the bony substance of a part of the middle cranial fossa.

While the secretion in the left ear decreased after the removal of the sequestrum, it continued in the right with its former intensity. The neighborhood of the right ear appeared healthy, only the region close behind the ext. aud. meat. felt somewhat swollen, and somewhat softer than the rest of the neighborhood. As I suspected here also the formation of a sequestrum, an incision 2–3 *cm.* long was made, December 26th, under chloroform, at the insertion-line of the auricle, when the external wall of the antrum was found destroyed, and its cavity filled with granulations. After careful removal of the granulations, and a few small particles of bone, a large sequestrum was extracted, measuring 23 *mm.* long, 13 *mm.* wide, 8 *mm.* thick. Its upper surface was smooth; the petro-squamous suture likewise ran along its longest side; moreover, the sequestrum consisted of the outer and upper angle of the antrum petrosum, and here also were found those sinuosities, corresponding to the spaces which later become pneumatic. January 15th, 1878, a small piece of bone could again be removed with the pincers, and on January 23d, a second somewhat larger piece, for the extraction of which the canal of the wound, which had already narrowed, had to be enlarged by an incision.

The secretion on both sides had become considerably less, in comparison with that before the operation, but we did not succeed in removing the offensive odor, although the ears were syringed twice daily with a solution of carbolic acid. There was no increase of temperature after these various interferences. The general health began to improve; so much so, that the boy gained more than two pounds in weight during his stay in the hospital, until the beginning of May. While the incisions were still kept open, granulations developed themselves far back, especially in the tympanum, and growing luxuriantly into the meatus, had to be touched repeatedly with Arg. nitr. and chromic acid. Although rough bone could still be felt on both sides, I finally let the canal of the wounds close so far, that only the point of the syringe could be just pushed through, and a regular cleansing gained. In spite of the continuous, although diminished, suppuration, the patient was discharged from the hospital in the beginning of May. The boy had grown so strong that he made attempts to walk, but did not trouble himself much, or at all, with what was going on around him.

Deterioration soon set in, with repeated diarrhœas; a catarrh closed the nose, and caused eczema at the nostrils; the boy began to grow weak again, so that I admitted him once more into the hospital on June 26th, 1878. The secretion from both ears had again become abundant, rough bone could still be felt on both sides with the sound, but on the left side only did one bit of bone appear movable. The main stress in treatment was laid as before, upon an improvement in the state of the system. The left fistulous opening was enlarged, and a small sequestrum extracted. All attempts to improve the bodily health failed; diarrhœa set in, with decreased appetite. On July 15th, after the patient, as the nurse said, on the evening before had presented no striking symptoms, death followed with general convulsions.

Autopsy:—After the cranium had been opened the surface of the brain was found to be very pale, the sinuses bloodless, and plugged here and there with small coagula. After the brain had been removed, there was found on the left side at the floor of the middle cranial fossa, and in the region just over the labyrinth, a spot as large as a bean, covered with soft granulations, and its neighborhood was tinted a sort of dirty red ; the same tint was also found on the right side, upon the dura mater which covers the tympanum, and its nearest surroundings. When water was injected from the meatus into the tympana, the dura mater on both sides was lifted up as far as the middle of both petrous pyramids, and a thin stream of water flowed, on the left side, through the above mentioned granulations. A discolored spot, as large as a cent, was found on the under surface of the temporal lobe of the brain, corresponding to that spot in the dura mater which was covered with granulations ; there was no purulent deposit nor infiltration, and these were also absent from the remaining surface of the dura mater and the periphery of the brain. When the brain was pressed even slightly, greenish yellow pus escaped suddenly from the discolored spot, and an incision revealed an abcess cavity as large as a walnut, in the left temporal lobe, with a capsule about 3 *mm.* thick, which showed firmer consistence than the surrounding brain-substance.

As the body could not be disfigured, the two temporal bones only were removed. Since the relations on both sides were very nearly similar, it seemed judicious to subject both preparations to a common examination. After the skin was removed, openings as large as a pencil were found a little above the meatus, and leading into the enlarged cavities of the mastoid process. The region of the tympana, and the cavities of the mastoid process were further opened by splitting the dura mater which covered them. All the signs of extreme destruction on both sides were now seen. The posterior-upper wall of the aud. meat. was absent both right and left, and on both sides the roof of the tympanum. *Left:* the necrosis of the posterior wall of the antrum was already circumscribed, and the sequestrum, not yet loosened, appeared on the posterior surface of the pyramid, well defined towards the neighborhood, to the extent of 1 *cm.* in its various dimensions. Moreover, the wall of the left bony tube was carious in its whole extent, the thin plate between the carotid and the canal of the tube was necrosed, and the outer wall of the carotid covered with pus. *Right:* A piece of the squamous portion as large as a bean above the meatus had been attacked with necrosis, and the bony canal of the tube was also carious in its whole extent. The tympana and the cavities of the mastoid process were covered with a swollen mucous membrane, more than 1 *mm.* thick, which at several spots, especially at the tympana, showed polypoid growths. On the left side the covering was absent only at the posterior wall of the antrum, where the bone lay bare, and also where it crossed over to the dura mater. Extensive purulent secretion was found between the dura mater and the temporal bone, and particularly on the left side the whole angle of the temporal bone from its outer end to the height of the porous acust. int. was surrounded with pus, and also the posterior surface of the temporal bone in its outer half, backward and downward to the suture with the occiput, was covered with pus. A layer of pus was also on the upper surface, encroaching over the labyrinth, and outward upon the squamous portion. The deposit of pus extended nearly as far on the right side as on the left, since the posterior and upper surface of the right pyramid was surrounded with pus, which however did not reach so far towards the middle line as in the left side. The nerves running into both meat. audit. int., were perfectly normal, and the wall of the labyrinth-capsule turned towards the tympanum did not seem to have been attacked by the destructive process. This wall was covered with a thickly covered mucous membrane, beset with granulations. It therefore seemed probable that the contents of the labyrinth were not involved. However, an opening of the labyrinth was not undertaken. We have to notice as regards the autopsy of the rest of the body, that a cavity as large as a walnut was found in the right upper lobe of the lungs.

REMARKS.

While the abundant secretion of pus, the offensive odor which could not be obviated, and the spontaneous evacuation of a small sequestrum, lead us to imagine the formation of sequestra before the operation, yet there were no points of support for the assumption that such an extensive destruction was present. Had we suspected it, the operative interference would have been spared, as purposeless. It is impossible to decide how early the abscess of the brain had developed itself, or whether it was already present before the operation or not. A question which arises after the result of the autopsy is this: Was the extensive detachment of the dura mater from the surface of the pyramid produced artificially, or did it indeed exist before the operation? It seems to me just possible that after a portion of the surface of the pyramid fell away when the sequestrum was removed, the syringings loosened the dura mater from its basis, and thus allowed the extension of the suppuration between the dura mater and the bone. I believe, however, that I may deny this possibility, since on the one hand such a separation seems improbable, considering the antagonistic pressure of the brain, and on the other hand, the cleansing of the incisions was always undertaken most carefully, and without the application of force, usually with a small ball-syringe, and with a larger syringe only when I did it myself. Hereafter it might indeed be recommended in such cases to use the syringe carefully.

The enormous extent of the destructive process, to say nothing of the unfavorable bodily state of the patient, prevented a cure in this case.

I desire here to mention still a *fourth case*, in which I lately had an opportunity of operating, although the cure is not yet complete.

M. S., 2¼ years old, was received into the Moabit hospital October 1st, 1878. His mother has suffered from a cough and pain in the breast after violent exertion. The brothers and sisters are sickly and weak. The patient was a healthy child from the time of his birth, and was suckled until he was 1¼ years old. When he was nine months old a purulent discharge appeared in the right ear, and has lasted uninterruptedly ever since, sometimes slight, sometimes abundant. Inflammation began behind the right ear, about four months ago, and led to the formation of an abscess, which the mother opened with a needle, when a large amount of offensive pus was discharged. The opening thus formed did not heal, and an offensive discharge continued. The patient is said to have had an inflammation of the lungs four months ago, since which he has had a cough, which has grown violent during the last fortnight.

Present state.—The patient is very poorly developed for his age, and is moderately well nourished. He has not yet learned to walk; he cannot speak a word, but his intelligence seems not to have suffered. His hearing is preserved in the left ear at least.

His face is pale, and the mucous membranes are anæmic. Dry bronchial râles can be heard on the breast. There is a purulent and offensive discharge from the right auditory meatus. The auricle is pushed forward, the region behind it is swollen, the skin is reddened, but there are no signs of recent inflammation. There is a fistulous opening 1 *cm.* behind and beneath the auricle, from which also extremely offensive pus flows. On probing at a depth of 3 *cm.* forward and upward, we touch rough and movable bone. The external auditory meatus is narrowed, and the bottom is full of coarse granulations. When a liquid is syringed into the fistulous opening, only a slight quantity escapes from the external meatus.

October 7th, after the patient had been chloroformed, I made an incision from the fistulous opening upward to the insertion of the auricle, and through the whole thickness of the swelling behind the external ear. The incision was made 3 *cm.* long, so that the auricle could easily be drawn forward with the sharp hook, and a free view gained into the cavity in the bone, which was filled with granulations. An arterial hemorrhage was stilled with the fixation-forceps. After the granulations were removed with the sharp spoon, a perfectly loose sequestrum was found in the bottom, and easily removed with a narrow spoon. The surface of the antrum petrosum was wholly destroyed as far as the tympanum, so that no more bony bridges were present between the cavity laid open by the incision and the external meatus, and the sound introduced into the external auditory meatus from the incision was visible at the bottom. The sequestrum removed, consisting of porous bone, was 14 *mm.* long, 8 *mm.* wide, 7 *mm.* thick. After its removal, a spot of bone as large as a lentil, and deprived of its periosteum, was found only at the outer end of the upper wall of the cavity. A thick drainage tube was inserted, and the after-treatment was antiseptic.

The temperature increased on the second evening only after the operation to 38.2, otherwise it remained normal. The secretion became normal after the operation, and lost its offensive character completely. October 15th, the general condition is good, leaving aside the somewhat diminished appetite, and the wound is beginning to fill up with healthy granulations.

REMARKS.

In this case also, as in Case 1, it was the surface of the squamous portion beneath the auricle, together with the framework below, which was found to be destoyed and forming the sequestrum. Considering the size of the sequestrum, in this case also, as in the previous cases, it was impossible to think of a resorption or spontaneous expulsion through the external auditory meatus, and we had to resort to extraction. As the operation was undertaken during a perfect reactionless stage of the process, and the surface of the wound since the operation has shown a continuously healthy appearance, I believe that there is no doubt of a favorable progress towards a cure.

DIAGNOSIS AND PROGNOSIS.

We can make an accurate diagnosis of the presence of sequestra in those cases only in which we can feel with the probe the movement of a piece of bone, deprived of its periosteum ; but there are other appearances which allow us to discover a sequestrum, although with somewhat less certainty: 1. The long duration of a purulent, offensive otorrhœa, which cannot be relieved by the usual treatment. 2. Luxuriant granulations from the tympanum, which cannot be cured, since they again grow rapidly after their removal. 3. When small sequestra have already been eliminated through the external meatus, without diminishing the secretion. 4. When fistulous openings are present behind the external ear, or were present with an abundant and offensive secretion. 5. When under these circumstances. swellings in the neighborhood of the external ear, diffuse infiltration, formation of abscess, or swelling of the lymphatic glands, are present.

When these various symptoms continue, we can diagnose the presence of a sequestrum with the greatest probability, even without being able to gain more accurate demonstration with the sound. In many cases, the symptoms mentioned under 1, 2 and 3 would be sufficient to establish our diagnosis. If the operation reveals no sequestrum, the patient will have been helped, in that the cause of the otorrhœa, namely, the formation of granulations in the antrum, or the caries present, will have been cured, or at least benefited. Even here indeed the result may be unfavorable, as I had opportunity of experiencing in one case.

In a weakly child, with caries and formation of granulations in the mastoid process, I had removed the granulations and a few carious patches. The strength of the child declined more and more after the operation, diarrhœa set in, and four weeks later there was a violent hemorrhage in the depth of the mastoid process from the posterior upper wall of the cavity, which could only be temporarily staunched, and which resulted fatally.

In making our *prognosis* we have specially to consider the constitution of the patient. Unfortunately we have mostly to do with weakly children of a scrofulous constitution, so that the prospect for a cure is decidedly unfavorable. The more healthy the bodily state of the child operated upon, the better the prognosis for the operation; while under unfavorable circumstances, the progress of the disease of the bone cannot be arrested.

If the case is not operated upon, the sequestrum may be eliminated, as has especially been noticed by Bezold, in this way, that it is pushed out by the formation of granulations towards the external auditory meatus, and can then readily be extracted. No matter how frequent an opportunity we have of observing this procedure, it can indeed only take place in the case of small sequestra, for larger ones, like that found in the three cases described, could not escape from the antrum to the tympanum, and from there outward, since this path as well as that through the tympanum, as also through the external meatus, is too narrow. Even smaller sequestra can only be pushed out along this round-about way, under extremely favorable circumstances. If the sequestrum remains in the antrum, a fistulous opening may be formed towards the external surface, or the secretion may flow off through the external meatus, and the patient stands in danger of losing his life: 1. By a degeneration of the bodily condition with subsequent scrofula or tuberculosis. 2. By extension of the morbid process to the neighboring organs, to the interior of the cranium, and to the great blood vessels. 3. By resorption of inflammatory products, by pyæmia and septicæmia.

As I have previously mentioned, children affected with the diseases described are already scrofulous, and have suffered before, or just after, the appearance of the disease, with inflammation of the eyes, swelling of the glands, etc. The scrofulous symptoms develop themselves further by the continuation of the purulent process, or they appear anew; while, on the other hand, we have opportunities of seeing the symptoms disappear after the sequestrum has been removed. I saw one case of swelling of the glands in the retro-maxillary region with formation of abscess, which disappeared rapidly and was cured, after I had removed a superficial sequestrum of the mastoid process, although every other treatment had proved of no avail. The complications which lead directly to death, only appear, as a rule, when the disease has lasted a long time. Unfortunately, we are unable, with our means of examination, to gain exact knowledge of the extent of the morbid processes present, as well as whether complications dangerous to life are present or not, so that we are never sure in giving a favorable prognosis.

THERAPEUTICS.

Schede has gained for himself the merit of having first used the Volkmann method of operating with the sharp spoon, in diseases of the mastoid processes in children, and in many cases with good results.* Schwartze also treated a large number of cases with Schede's method, and with equally favorable results. In spite of the favorable results which were gained in Halle, since, indeed, the operation was performed before the threatening symptoms had appeared, Bezold has lately expressed the opinion that an operative removal of the sequestrum, before it has advanced towards the aud. meat., is only indicated "when threatening symptoms intimate that the upper or inner wall of the antrum, and the membranes of the brain are beginning to be affected, perhaps also, with a facial paralysis of long duration, if the sequestrum is already movable."* We could only coincide with this treatment, if we were still able to arrest the process at the approach of threatening symptoms, but when tuberculosis, meningitis, abscess of the brain, or pyæmia are present, we will scarcely succeed, by the operation, in preventing a fatal result. Delaying the operation seems synonymous with doing nothing at all.

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* Arch. f. Ohrenheilkunde, Band VI, pag. 287.

It is, on the contrary, of the greatest importance to prevent the occurrence of these complications, and this can only be done by operative interference. We must keep this fact in view, that if we do not operate, the complications must ensue sooner or later, and lead to death, while by the operation we effect a cure under favorable circumstances; whereas, on the contrary, under unfavorable circumstances, we have at least made the attempt to obviate the fatal result which surely would have followed had we not operated. Starting, therefore, from these points of view, I feel authorized, in spite of the unfavorable result of the two cases just described, to assert as a maxim:

We are to undertake the opening of the mastoid process, when we have diagnosed a sequestrum.

As I have just explained, the operation can be performed, not only when our diagnosis is absolutely sure, but also when it seems very probable; since, if we find no sequestrum where we operate, we shall at least have helped the patient, by removing the granulations and carious patches present, and thus favored a cure.

It is very difficult to decide upon the exact period for operating, and I believe that we can only establish the general rule, not to operate too early, since the looser the sequestrum, and the more the granulations have already developed themselves between the sequestrum and the walls of the antrum, so much the more favorable the prognosis. I believe, therefore, that it seems advisable not to operate until the purulent offensive discharge has lasted for some months.

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* Arch. f. Ohrenheilkunde, Band XIII, page 53.

METHOD OF OPERATING.

I have already in a previous anatomical paper, on the perforation of the mastoid process,* called attention to the fact, that at the age of childhood the anatomical relations as regards cutting into the transverse sinus, are more favorable than in adults, since the sinus is curved forward less sharply, and moreover the field of operation downward is not circumscribed. While in adults the curvature of the sinus is especially marked in the lower part of the mastoid process, this curvature is not yet present in childhood. In one hundred specimens in adults, I found the shortest distance between the sigmoid fossa and the posterior wall of the external auditory meatus, 41 times, 1 *cm.* and less (once, 5 *mm.*, five times, 6 *mm.*, and six times, 7 *mm.*), while in the newly born the distance in 40 temporal bones, from the posterior wall of the auditory meatus (measured straight upward and outward from the posterior end of the annulus tympanicus) to the posterior cranial fossa, resp. signoid fossa, never measured less than 10 *mm.*, and averaged 12 *mm*; in twelve temporal bones, from 1–5 years of age, never less than 8, and averaged 10 *mm.*

When we look at the anatomical relations, the thin layers of bone which are found between the antrum petrosum on the one hand, and the middle and posterior cranial fossa on the other, when we further recall to mind that we cannot judge how far the destructive process has advanced towards the cranial cavity, the conviction will force itself upon us that only the most careful interference is justifiable, and Schede even in his first publication warns us to be careful in our use of the sharp spoon. Even if practical experience on the living causes " the boldest use of the sharp spoon" to appear harmless to some operators, it seems to me on the ground of the relations just discussed, that there should be little temptation to gather practical experience on the living by such a procedure.

The operation is to be performed in the following manner: an incision is to be made at the insertion of the auricle, and in such a way that the middle of the incision lies just below the level of the opening of the external auditory meatus. If a fistula is present, the incision either goes through the fistulous opening, or is to be united with it by a diagonal incision. In making the incision through the soft parts, we must take care not to turn it forward, since the surface of the mastoid process passes over into the posterior wall of the auditory meatus, without any sharply defined boundaries, and by pressing forward, we run the risk of only loosening the posterior wall of the external auditory meatus, and from here reaching the tympanum. This rule should be especially observed where the soft parts are greatly infiltrated. It seems of importance that the incision should not be too small, but be 2–3 *cm.* long. The edges of the wound must be held apart with sharp hooks, so that after the bleeding has ceased, the field of operation can be thoroughly examined.

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* V. Langenbeck's Archiv., Band XXI., Heft 2.

In all the cases in which I operated, either a fistula was already present, or after the soft parts were cut through, there was an opening in the bone which could be enlarged with the sharp spoon. In one case only did I have to employ the chisel, in order to enlarge a small opening. The granulations lying in front are to be removed with the sharp spoon. If the antrum is opened and laid bare in this way, it can be examined most carefully with the probe, or with the tip of the finger introduced. If loosened sequestra are present, they can be seized with pincers or forceps, and extracted, or as proves most suitable, may be pried out with the spoon. The sharp spoon also offers the best services in removing the bone that has become softened by caries. The precautionary measure suggested by Schede, to use the sharp spoon only when the bone is found to be softened to a certain degree, is not be neglected.

In my operations I have followed the maxim of confining myself in the removal of the morbid parts to what was most needed, *i. e.*, chiefly the removal of the granulations and the extraction of such sequestra as were fully loosened, and could easily be reached. It seems then necessary in the after treatment to keep the wound open by a thick drainage tube, so that in the subsequent days we may have a full view into the depths of the wound, from which now the sequestra gradually loosening themselves, may be detached with the probe and removed. It seems also desirable in the latter stage (as has been emphasized especially by Schwartze and v. Tröltsch) to keep the aperture open as long as possible, by means of a leaden nail, or a short, leaden tube, until we are sure that the mastoid process is in a sound condition. The important point in the after-treatment is the regular removal of the accumulated secretion, for which purpose we prefer syringing at first with antiseptic, later with neutral, and lastly with astringent fluids.

CONCLUSION.

Although in the previous pages I have communicated my experience in the formation of sequestra in the mastoid process of the child, and added the conclusions resulting from my own operations, I must especially note, that I do not by any means cherish the opinion that the question discussed can be already finally decided. After a new stimulus was given from Halle to the operative interference in the diseases of the mastoid process, and Schwartze especially had gained much merit for the operative treatment of these diseases, by the number of his operations, I thought myself justified in communicating the experience which I had an opportunity of collecting in children. Considering the manifold relations which come into account in the diseases and operations in the mastoid process, it seems to me desirable that the special experiences which have been made should be published, since it is only by working together at these questions still in suspense that they can be settled. I shall therefore take it upon myself to communicate in the next volume of these ARCHIVES a few observations, which I have had an opportunity of making in the corresponding diseases of adults.

ON THE SINUS TYMPANI.

By Dr. H. STEINBRÜGGE, in Heidelberg.

Translated by James A. Spalding, M. D., Portland.

IN sawing through the pyramid of a petrous bone belonging to the left side, in which the section was made at right angles to the long axis, and close behind the fenestra ovalis, I found on the lateral segment a noticeable excavation of the wall of the labyrinth, which extended beneath the canal for the facial nerve, almost to the ampullar end of the frontal, as well as the posterior end of the horizontal semicircular canal, and whose deepest portion reached below the floor of the tympanum. As this excavation was unknown to me, I at once examined thirty-seven petrous bones, two of which were from children, nineteen of them being sawed through in the direction just mentioned, and found that the sinus was present thirty-five times in varying size, and in two petrous bones only reduced to a shallow and irregular groove. The tympanic cavities and mastoid cells of both of these bones exhibited traces of previous inflammatory processes. Hence the presence of the sinus may be regarded as normal.

Its situation is somewhat hidden and easily escapes the eye, so long as the hammer and anvil are still in the tympanum. When the wall of the labyrinth is laid open to view by sawing away the outer wall of the tympanum, we gain a distinct view of the entrance into the sinus; but only a comprehension of its form and depth after we have sawed through the pyramid between the summit of the eminentia pyramidalis, and the posterior edge of the fenestra ovalis. Macerated bones are the most perfect specimens, since the sinus also is invested with a continuation of the mucous membrane of the tympanum, and hence appears smaller and narrower in alcoholic preparations. If the mucous membrane is thickened by disease, the entrance may as a consequence become almost closed.

The sinus lies backward from the round and oval windows, and nearly in the centre between them, always somewhat higher than the former. In regard to direction, its entrance corresponds either to the plane of the wall of the labyrinth, or it is directed obliquely forward and outward, so that it appears more nearly opposite the round window, and has a narrow and fissure-like appearance. In these cases it will be most easily overlooked.

While its anterior and lower edge is formed by the posterior side of the triangle which surrounds the entrance to the cochlea, the eminentia pyramidalis represents the posterior boundary. The form of the entrance is sometimes oval and sometimes horse-shoe shaped. In the former case it appears like a second oval window with its axis perpendicular. The ridge of bone so frequently present, which passes over from the summit of the eminentia pyramidalis to the posterior and lower edge of the oval window, or somewhat deeper to the promontory, forms with the tendon of the stapedius muscle the upper border, or bridges over the sinus, and divides the entrance into a smaller upper, and a larger lower portion.

If we saw through the pyramid in the way just mentioned, the largest portion of the sinus falls into the lateral segment, while on the medial segment only a small groove remains between the round and oval windows. The contour of the larger cavity in the lateral segment resembles somewhat that of a helix, or the half of a heart on a playing-card, divided perpendicularly, the point of which would correspond to the lowest part of the excavation. The eminentia pyramidalis arises in a semicircular shape from the bottom of the sinus, and so appears far larger than one would suppose on looking at it from without.

We learn from this that the tympanum beneath the canal for the facial nerve extends further into the wall of the labyrinth than is usually assumed, and in order to fix these dimensions more accurately, I have measured the height and depth of the excavation (the diameter at right angles to the long axis of the pyramid) in the bones that have been sawed through. The antero-posterior diameter (parallel to the long axis of the petrous bone) is not accurately to be measured in preparations that have been sawed through vertically; it measured 3 *mm.* in a petrous bone that had been sawed through horizontally, and which offered a well-developed sinus.

In eighteen cases the greatest diametrical height measured, three times, 6 *mm.;* the least, 3 *mm.* The average was 4.3 *mm.* The greatest depth measured 5 *mm.;* the least 2 *mm.* The average measurement was 3 *mm.* Furthermore, measurements were made of the distance of the deepest spot of the inner wall of the sinus from the ampullar end of the frontal, and the posterior end of the horizontal semicircular canal, and finally the distance of the same spot in an oblique direction upward and outward to the middle edge of the divided Fallopian canal. The distance to the frontal semicircular canal gave an average measurement of 0.9 *mm.*, to the horizontal semicircular canal 1.4 *mm.*, and to the facial canal 2.5 *mm.* The lowermost part of the sinus sometimes extends below the line of the neighboring floor of the tympanum, which, as is well known, reaches less deeply in the posterior segment than in the middle of the tympanum. The sinus in one petrous bone was united by a passage with a deeper-seated cavity, which bordered closely upon the fossa jugularis.

I did not find any mention of the excavation just described in the later works of anatomy and otology, so far as the literature concerned stood at my command. J. F. Meckel,* however, says in describing the wall of the labyrinth: "The space between the triangular eminence, the promontory and the oval window, forms a distinct excavation, the sinus tympani." Hence it seemed suitable to me to retain this name. Wildberg[*] speaks of a distinct excavation behind the promontory, over which one or two ridges of bone cross from the eminentia pyramidalis. Schelhammer[†] especially, amongst the older anatomists, occupies himself with the sinus, and besides communicates many physical researches on the conduction of sound by solid and fluid media, as well as on the reflection of waves of sound. He calls the tympanum concha. In his opinion the waves of sound only reach the labyrinth through the round window; but since the membrana secundaria does not lie directly opposite the membrana tympani, the sinus appears to him necessary to collect the waves of sound that have become dispersed in the tympanum, for the purpose of strengthening even slight tones, and reflecting them into the cochlea. After describing the inner end of the external auditory meatus as a spoon-shaped widening which equals the tympanum in size, he says: "Opposita vero ipsi est statim conchæ pars postica, in qua *nova cavitas* ita efformatur, ut *proxime adjacens* cochleæ foramini exinde immediate sonum immittere in eam possit." And later he says: "Certe qui hæc spernunt, nunquam poterunt causam reddere, cur non e directo vel e diametro, a natura architechrice antra ista (*i. e.*, cochlea and its entrance) sint meatui opposita, ut sine mora sonus illabatur, quod fuisset factu facillimum; quæ omnia declarare nobis minime est arduum, etc." [‡]

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* Handbuch der Menschl. Anatomie. Berlin und Halle, 1820.

Although the literature on this theme is not exhausted by these quotations, they will however suffice to prove that the sinus was already known to a few of the older anatomists, but later fell into oblivion. Its presence offers just now only an anatomical interest. Further observations must decide whether it also deserves to be withdrawn from oblivion in a physiological or pathological point of view. But this much can be asserted, that in exudative processes in the tympanum it may be an obstacle to a cure, just like every other sinuous wound. On the one hand, exudations might be retained in its depths, and on the other hand it might be very difficult, even when the membrana tympani is fully destroyed, to cleanse the cavity described, and to make it accessible to the application of remedies. Since further the inner wall of the sinus reaches to within 0.9 *mm.* of the frontal semi-circular canal, we might imagine the possibility of a propagation of inflammation in carious processes from the tympanum to the labyrinth. But leaving out of consideration the fat that the bony partition wall consists of very thick, compact substance, I could recognize no changes in the preparations that I examined which could suggest any such processes.

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[*] Versuch einer Anatom.-physiol. Pathologie. Abhandlung über die Gehörwerkzenge des Menschen. Jena, 1795.

[†] De Auditu 1684, Pag. III., Cap. 5, § 1 and Cap. 9.

[‡] The author also quotes Morgagni, Vieussens, Cassebohm, and Comparetti. These quotations, being of little value, have been suppressed in the English version of this paper.—K.

EXPERIMENTS WITH EDISON'S PHONOGRAPH.

By Dr. OSCAR WOLF, of Frankfort-on-the-Main.

Translated by Dr. Swan M. Burnett, Washington, D. C.

(*With six wood-cuts.*)

FOR a year now the numerous, rapidly appearing publications of T. A. Edison, and his acoustico-physical instruments: electro-motograph-telephone, the phonograph, the microphone, megaphone, and tasimeter, have figured conspicuously not only in purely scientific circles, but also throughout the whole intellectual world. It seems time, therefore, that a critical sifting be made of that which is essential in these productions from that which is unessential to the furtherance of science.

This sifting, however, cannot be properly carried out just at present, because a number of further investigations are needed to settle the question whether the scientific value and technical application of a part of these discoveries bear a correct relation to the unlimited praise accorded them by the current literature.

I shall limit myself, in this paper, to a consideration of a work of Edison's which is of undoubted value to our branch of science, because it furthers the study of the vibration of membranes as well as the physico-acoustical definition of the sounds of speech, and I shall add a small number of experiments in demonstration of this fact.

As is well-known, the construction of the phonograph rests on the law that tense, somewhat concave membranes are especially adapted for accommodating themselves to all varieties of sound waves affecting them.* The construction of Edison's instrument is as follows:

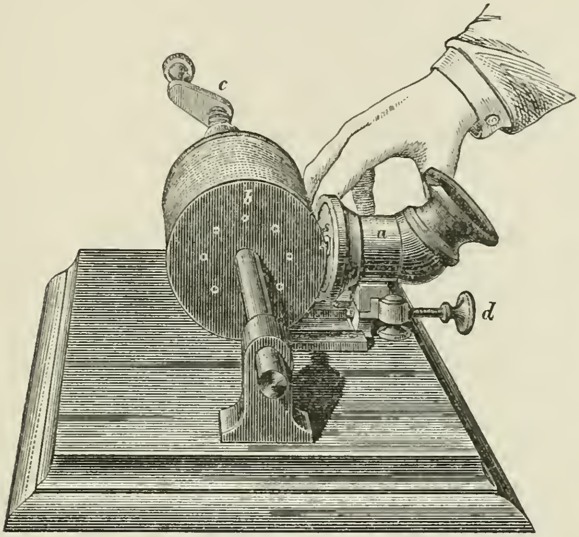

FIG. 1.

At the lower end of a sound receiver *a* (Fig. 1) is attached a small metallic point *s*. This point is applied, with slight pressure, against the metallic cylinder *b* in front of it. This metallic cylinder, revolving on an axle which rests on two supports, is turned by a crank *c*. In one end of the axle is cut a male screw, and in the corresponding part of the support there is a female screw, so that in turning the handle the cylinder not only revolves but at the same time moves in a lateral direction. It is evident then, that a fixed point which lies against this cylinder revolving and moving laterally at the same time, will describe a spiral on the surface of the cylinder. This point would of course imprint a spiral line on a sheet of tin foil wrapped around the cylinder. If the membrane be not vibrating but be in a state of rest, the point attached to it will inscribe a simple smooth line on the tin-foil passing under it. If, however, the membrane is set in vibration by speaking or singing or playing a musical instrument into the sound-receiver, while the cylinder is moving, the point will impress the corresponding form of the vibration on the tin foil. It impresses, as we may say, the "sound figures" (Klangfiguren.) *

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* Compare "The mechanism of the ossicles and membrana tympani," Helmholtz—Translation, N. Y., Wm. Wood & Co., 1873, and the author's work "Sprache und Ohr," 1871, p. 187, *et seq.*

When it is desired to have the apparatus repeat the spoken sounds the metallic point is slightly withdrawn from the cylinder by means of the screw *d*, and then brought back to the position it occupied at the beginning of the experiment. The point is then again brought in contact with the tinfoil and pressed by means of the screw lightly into the first "sound figure," and the cylinder turned as before. While by means of the first turning the vibrations of the membrane cause the point to impress the corresponding "sound-figures" in the tinfoil, on the second turning, these impressions over which the point glides call forth a corresponding vibration of the membrane.

The effect is wonderful; the same words and sentences, with their identical pitch, timbre and rhythm, come back to us from the sound-receiver. And as long as the figures remain distinct, the experiment may be repeated with the same result. We have made a stereotype, as it were, which holds the words, and we have only to turn the cylinder, and the phonograph will speak.

The instrument which I have employed in these experiments is evidently *not yet perfected*, and is capable of improvement. Compared with the action of a sound-conducting apparatus, the proportions of the curved sound-receiver are similar to those of our auditory meatus and the drum membrane, magnified about ten times in all diameters.† The point is set in the membrane to correspond about to the insertion of the hammer-handle. The connection of the membrane to the sound-receiver differs from our sound-conducting apparatus in the following points: The membrane of the phonograph stands at right angles to the wall of the sound-receiver, while the *M. T.*, as is well known, forms an angle of 140° with the upper wall of the meatus (v. Tröltsch). The membrane of the phonograph consists of paper coated with shellac varnish, in order to avoid the effect of the dampness of the breath from speaking into the mouth of the receiver, and it is only slightly curved inward when the point is pressed on the cylinder. If it were possible to prepare a fine *animal membrane* retaining the same curvature and tension as that of the membrana tympani, the vibrating power of the apparatus would be very much increased.

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* I am of the opinion that these impressions, which can be made out in these various forms by a good magnifying glass and which I will presently describe, can very properly be called "sound-figures."

† The diameter of the circular membrane of the apparatus amounts to 8-9 *cm*.

A further desideratum is the substitution of some other metal for the tinfoil, which would preserve for a longer time the figures traced on its surface. Recently it appears that Edison employs a metal alloy, which hardens with great rapidity. This would be much better adapted for acoustic experiments than the tinfoil used by me.

In the experiments which I have made I have had the pleasure of seeing my former investigations on the acoustic peculiarities of the sounds of speech corroborated and extended.*

That the difference in the *timbre* (Klangfarbe) is manfested in the alteration in the *form* of the vibrations is clearly shown by the phonograph. When, for example, the vowel *A* is spoken in a deep bass tone the sound figure is as follows:

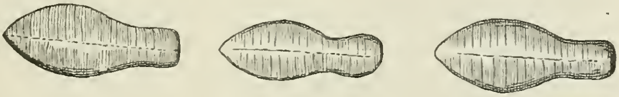

FIG. 2.

When, on the other hand, the vowel *A* is spoken in a treble tone (Kinderstimme) the indentations are smaller and shallower as in figure 3:

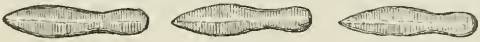

FIG. 3.

According as the tone of the vowel is sustained for a longer or shorter time will there be a greater or less number of these sound figures one after the other. The vowel *O* gave a figure about the size of that of *A* as shown in figure 4:

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* See "Recent investigations on the test and derangements of hearing." Archiv. of Oph. and Otol., Vol. IV, No. 1, p. 87.

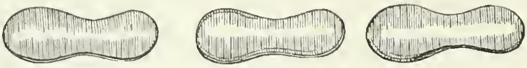

FIG. 4.

The vowels *E* and *I*, on the other hand, impressed much smaller forms on the tin-foil, and the *S* sound, the highest tone of speech, produced the smallest and most numerous impressions (figure 5).

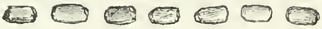

FIG. 5.

The consonants *B*, *K*, *T*, *F* when spoken alone, gave, on account apparently of their weak tone-intensity, no definite sound figures, while in connection with vowels they were given back from the instrument quite distinctly; the words Papa, Bote, Kuckuck, were very distinct. In those cases the sound figures of the vowels are found altered in the same manner as by the tone borrowing sounds *L*, *M*, *N*, and *W*, which, as I have previously shown, modify the commencement and termination of the vowels and in this manner are made perceptible.

In the sound of *R*, on the contrary, the membrane is thrown in very strong vibration, so that the point makes large and tolerably deep, almost round impressions (fig. 6).

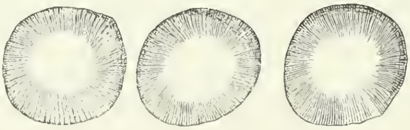

FIG. 6.

Words such as "Hurrah," "Wacht-parade," come out with particular fulness and distinctness. These observations confirm my former opinion that the excursions of the membrana tympani are relatively much greater under the vibrations of the sound of *R;* hence, those patients who have lost a portion of their *M. T.*, hear, in the experiments the *R*-sound with greater difficulty, whilst the *S*-sound is understood in all cases with extraordinary distinctness.

Whether the further observation which was made during these experiments with the phonograph, that after long continued speaking into the receiver, (so soon as the membrane in consequence of becoming damp began to relax) the *S*-sound was the first to vanish, is of any or no value as regards the physiology and pathology of the conducting apparatus, future experiments must decide. This fact corresponds however, with the clinical observation first brought to notice by Moos, that in sclerosis of the drum and its contents, with secondary labyrinth affection, the higher tones and particularly the hissing sounds suffer first of all and are most difficult to understand.

Since our auditory nervous apparatus is extraordinarily sensitive to the highest tones of the scale, so that they can occasion considerable pain to the healthy ear, it is highly probable that the corresponding most sensitive terminal filaments of the nerve are affected, most probably by sympathy, and are therefore the first to be suspended in their function.

Though the phonograph repeats all shades of speech in respect to its timbre, rythm and pitch with tolerable truthfulness, so that from the character of the tone given out from the instrument, one can easily tell who it was that spoke into the sound-receiver, and though the tones of various instruments such as the violin, the clarionette or trumpet can be distinguished from each other, yet the timbre of the tones and sounds reproduced by the membrane is relatively *void of* metallic quality, as it is easy to understand in an instrument composed of a proper membrane and a brass sound-receiver. Finally, it is a very interesting fact that the instrument can be artificially thrown out of tune by a rapid revolving of the cylinder. Let any-one sing any song into the sound receiver, and revolve the cylinder with about the same rapidity at the repetition as when singing into the instrument, the song will then be repeated with perfect purity. If, however, on a second repetition, the revolutions are made more rapid, the song can be transposed, in a certain measure, at will, and pitched one or more tones higher. It is evident that the relations of the once recorded tones to each other remain the same; on the other hand, the whole number of tones taken together will make a greater number of vibrations in the same length of time and therefore be correspondingly elevated in pitch. In order, therefore, to make exact experiments with the phonograph, it is necessary to have the crank turned by means of machinery, such as a clock-work, which shall revolve the cylinder with the same rapidity during the repetition as when the instrument is spoken into; however, this ingeniously contrived instrument, even in its present form, offers sufficient that is interesting and instructive to the student of Acoustics, to be highly valued for its scientific importance, and to lead to further experiments.

CLINICAL CONTRIBUTIONS TO OTOLOGY,

FROM THE PRACTICE OF DR. C. R. AGNEW.

REPORTED BY DR. DAVID WEBSTER, NEW YORK.

CASE I.—*Pain in the ears with spasm of the Tensor Tympani, caused by the use of strychnia internally.*

Rev. W. C. J., æt. 30, was referred to us by his physician, Dr. Daniel Lewis, on account of a large central scotoma of his left eye which had, for nine months, produced serious "confusion of vision." Ophthalmoscopic examination showed changes in and about the region of the macula. He was placed upon Bichloride of Mercury with Iodide of Potassium for about a month, had several hypodermic injections of a solution of nitrate of strychnia, and was sent home with vision increased from $\frac{8}{200}$ to $\frac{20}{100}$, and with instructions to take one pill containing one-sixtieth of a grain of strychnia, thrice daily.

About three weeks later I received a letter from him in which he said :—"The pills I take regularly, omitting them only when it is necessary, or I forget them. If I am not mistaken they cause a pain in my head, especially in my ears. It comes on after taking them and does not appear when I omit them. The sensation is of *strange* rather than *acute* pain."

As I had given strychnia, both hypodermically and by the stomach, in many cases before, and no patient had ever complained to me of similar effects of the drug, I thought the matter worth investigating further, so I wrote to Mr. J. asking him to describe to me more specifically the effects of the strychnia upon his ears, and suggesting some things which I desired him to note. The following is his reply :—"I do not have any more of the pains n my ears and therefore cannot make the observations you suggest. They stopped two weeks ago. As nearly as I can remember them I will describe them :

"I am in the habit of taking the pills just before or during my meals. When I was having the pains they came about the close of the meal, with a sudden thump, and would beat, for a few minutes, against the membrane of the ear. How long I cannot tell, as I was not in the habit of paying much attention to them and they went away without any absolute consciousness on my part of when, I would simply forget them. The first few beats were all that gave me any very great annoyance."

Pain in the head is not a very unusual effect of strychnia, but this is the first case I have seen or heard of where pain and beating in the ears was observed as an effect of the drug. The beating sensation was, I am inclined to think, due to spasmodic twitchings of the tensor-tympani muscles, and I can conceive it to be possible that the accompanying pain was caused in the same way.

It is true that we have all met with cases of throbbing pains in the ears, occurring as a symptom of acute inflammation of the middle ear, and taking its throbbing character from the pulsations of the heart, propagated through the internal carotid and other arteries in the neighborhood of the drum of the ear. But in the great majority of such cases only one ear is involved. Moreover, pain and throbbing are by no means the only symptoms in such cases. But the history of the above case proves, sufficiently, that the sensations were due to the strychnia, and the only plausible explanation I can think of is the one I have given.

CASE II.—*Mastoid periostitis occurring during the course of "continued fever"—followed by acute suppurative inflammation of the middle ear—incision—recovery.*

Charles D., æt. 69, farmer, was referred to Dr. Agnew by his family physician, Dr. Fred. Corse, of Kingston, Pa., with a letter of which the following is an abstract:—"The bearer, Col. D., was attacked the first of last February with epidemic influenza, at first affecting the nasal and bronchial mucous membranes, subsequently producing severe constitutional disturbance, continued fever and typhoid lesion of the bowels. During the fever the right mastoid process became swollen, red, painful, and extremely sensitive to the touch. As the fever subsided the signs of ulceration of the mastoid cells subsided, *pari passu*, leaving a whitish, inodorous discharge from the right external auditory meatus. Yesterday, May 29th, the region of the mastoid again became tender and painful without change in the character of the discharge."

The patient arrived at New York a little more than two weeks after the above letter was written. He stated that the pain in and about the ear had been very severe for nearly three weeks, and had increased in severity so that he had not slept at all for the last four nights. He also had a constant roaring in the ear. The tissues over the temporal bone were so swollen as to push the auricle off from the side of the head about three-quarters of an inch. The swelling extended considerably in front of the ear, at least two inches above, and backwards nearly to the occiput, and the whole area was the seat of great tenderness.

The walls of the external auditory canal were swollen and boggy, and prevented a complete view of the membrana tympani, but after syringing out the pus with warm water, by using a very small speculum a bubble of pus could be seen protruding from the depths and on inflating by Valsalva's method this bubble was lifted, but there was no "perforation whistle."

The ear seemed to be totally deaf to external sounds, but heard the turning fork when applied to the forehead or vertex.

The same afternoon Dr. Agnew made an incision down to the mastoid, about one inch and three-quarters in length, and cutting down through the periosteum very thoroughly. The depth of the wound was about one inch at its deepest portion, and the tissues cut through were tough and brawny, and the bone was roughened in spots. Little or no pus made its appearance, and the amount of bleeding was moderate. Lint was stuffed down to the bottom of the wound throughout its whole extent, and hot poultices of flaxseed or slippery elm were ordered to be applied about every two hours. The following day the patient reported that he had rested well, and there was marked amelioration of all the symptoms. In a day or two a slight discharge from the wound set in, and this was encouraged by continued poulticing, the tent in the wound being changed every two or three days. The ear was gently syringed with warm water from time to time, and occasionally inflated by Politzer's method. There was a gradual subsidence of all the symptoms, and in a little over a month Col. D. was allowed to return to his home in Pennsylvania. The discharge from the ear soon ceased, and the organ still remained well when we last saw him more than four years later. The ear did not recover useful hearing, however.

CASE III.—*Inflammation of the mastoid without demonstrable inflammation of the middle ear—incision—recovery with fistulous communication between the mastoid cells and the external auditory canal.*

March 17*th*, 1875.—Mrs. S., æt. 70, sent for Dr. W. Cheatham, then House Surgeon of the Manhattan Eye and Ear Hospital, now of Louisville, Ky., who noted the following history:

"Five weeks ago, while sneezing, she 'felt' a crackling noise in her right ear. It sounded as if something had burst in the ear. She has suffered intense pain in and behind the ear ever since, and has, in consequence, usually passed sleepless nights. There has been no discharge from the ear at any time. No physician has been consulted. She tried once to relieve the pain by dropping camphorated oil into the ear, but this made the ear worse. She has dropped laudanum into the ear three or four times a day for three weeks, and this has given her some relief.

"She is now suffering very much from pain over the whole of the right side of her head, and extending down her back and neck. There is great swelling, tenderness on pressure, and redness over the mastoid. The swelling of the walls of the external auditory canal prevents examination of the membrana typani. There is facial paralysis of the right side. The patient experiences some difficulty in swallowing, but this, she says, existed before the ear disease.

"She states that her sight has failed rapidly during the last three weeks, and that she sees all distant objects double. She is subject to asthma, but has not suffered from it since the commencement of the ear affection. Hearing was reduced to ability to hear the watch when pressed against the auricle."

I saw the patient on the evening of the same day, with Dr. Cheatham, and made an incision down to the mastoid, about one inch in length, half an inch behind and parallel to the attachment of the auricle. So great was the swelling that the scalpel penetrated to a depth of three-quarters of an inch by measure. No pus escaped, but there was free bleeding. No examination for diseased bone was made on account of the severe pain caused by the incision, the operation being done without any anæsthetic. The wound was well stuffed with lint and hot poultices applied, to be exchanged every three hours. An opiate was given to relieve the pain. 18*th*.—The pain continued up to six o'clock this morning when it abated, and at eight o'clock she was found sleeping.

There is slight discharge from the external auditory canal—the first that has been seen. There is less tenderness over the mastoid. She is now able to lie on her right side, which she has not done for the last three weeks on account of the increase of pain so produced. *P. M.*—Visited the patient with Dr. Roosa. She says she feels like a new person. She has slept most of the day without an opiate. The discharge from the auditory canal is much more abundant, and the tenderness over the mastoid is less. Dr. Roosa advised a continuance of the warm poultices.

19*th.*—The patient rested well without an anodyne. Pulse 82; temperature 96½°; appetite and vision improved. Removed tent and inserted a clean one. Poultices to be continued and the ear to be syringed several times a day with warm water.

20*th.*—Tenderness and swelling over mastoid diminishing; pulse 82; temperature 98½°. While exploring the wound with a probe a sinus was found large enough to admit a No. 1 Bowman's probe, a quarter of an inch in length and extending forwards, upwards and inwards from a point nearly opposite the upper portion of the attachment of the auricle. Changed the tent and ordered the poultices to be continued. Ordered fifteen drops of Tinct. Fer. Chlor. three times a day.

23*d.*—Only slight tenderness over mastoid. Found the tent removed and the incision healing.

24*th.*—Found the patient cheerful and much improved. All tenderness gone. To leave off poultices, and dress the healing cut with a greased rag.

26*th.*—The patient says that her appetite is excellent. The double vision has disappeared and she declares that she sees as well as ever. There is still paralysis of the 7th nerve and a slight discharge from the ear. There has never been any discharge from the wound, which is now rapidly healing. The swelling of the walls of the canal is almost gone.

31*st.*—The facial paralysis is much better; she swallows with less difficulty; the incision is nearly healed; there is still slight discharge from the ear. She declares that she feels better than before for six months.

April 12*th.*—The patient came to the Manhattan Eye and Ear Hospital. There is still slight discharge, but the membrana tympani is intact. The posterior wall of the external auditory canal is swollen, and near the junction of the cartilaginous with the membranous portion a teat-like process is seen. This teat-like process is a small mass of granulation tissue surrounding an opening through which the bent end of a probe can be easily passed. It seems most probably that this opening is the source of the discharge. The facial paralysis has almost entirely disappeared, and the patient now hears the watch on contact.

21*st.*—A slight discharge still continues. The teat-like process remains unchanged, and pus can be seen oozing from it. Dr. Agnew who saw the patient at this visit, advised an incision through the granular mass on the posterior wall of the canal, but the patient objected to it as she "felt perfectly well."

CASE IV.—*Chronic suppurative inflammation of the mastoid cells, with a sinus communicating with the external auditory canal, and without demonstrable inflammation of the middle ear.*

Albie D., æt. 30, states that she began to have noises in her left ear years ago, and that these noises have been accompanied with soreness about the ear, and with pain. The pain often extends to the top of the head, and down into the neck. She is also troubled with dizziness. She has sometimes had a little discharge from the ear after working at it with a hair pin. Her right tonsil is enlarged and she catches cold easily.

H. D. R $\frac{14}{60}$, L $\frac{8}{60}$. The tuning fork applied to the bones of the skull is heard better in the right ear.

In the left external auditory canal is seen a small granular mass, supero-posteriorly, and within an eighth of an inch of the membrana tympani. A No. 1 Bowman's probe, with the end bent at a right angle, is easily hooked into the mouth of a small sinus which is concealed by the small granular mass alluded to. The membrana tympani is intact.

The patient states that she was obliged to give up doing general housework on account of the pain produced in the top of her head by going upstairs, and now follows the occupation of a cook.

No treatment was advised, except that of cleansing the ear daily by syringing with warm water.

Cases II, III and IV, are remarkable as having been cases of primary inflammation of the mastoid cells. All the text-books on the ear treat mastoid cell inflammation as secondary to, or a complication of, inflammation of the middle ear, and I think that it is nowhere stated that the disease sometimes occurs independently of the latter. In Cases III and IV the membrana tympani was found intact, and there was no evidence that it had ever been perforated; but there may have been a secondary inflammation of the middle ear in both cases, not sufficiently severe to produce ulceration of the drum-head, while the primary inflammation of the mastoid cells was such that in both cases, caries of the bone was produced, resulting in a persistent fistulous opening into the the external auditory canal. In Case II it will be remarked that the mastoid inflammation existed for some time before there was any discharge from the ear, and the latter, indeed, did not make its appearance until the former had subsided.

Although in the majority of cases there is no doubt that the inflammation extends from the posterior nares, along the Eustachian tube, through the middle ear, into the mastoid cells, yet there is no good reason for believing that the inflammation cannot, in the nature of things, originate in the mastoid cells themselves, and travel, perhaps, in the opposite direction.

In some of the following cases the inflammation seems to have followed the usual course, commencing in the middle ear and extending to the mastoid cells.

Case V.—*Acute inflammation of the middle ear, with inflammation of the mastoid cells, resulting in a fistulous communication between the mastoid antrum and the external auditory canal.*

April 3d, 1873.—C. W. E., æt. 62, merchant, states that three weeks ago he caught a severe cold in his head. He characterizes the cold as an "epizootic," and says that the discharge from his nostrils was very great. About two weeks later his left ear became affected with a sense of fulness and obstruction "as though stopped up with wax," and soon after, broke and began to discharge. The discharge still continues. He has had no pain to speak of, but "constantly hears noises of water and of the beating of the heart." Hearing distance, right, $\frac{14}{48}$; left, click of nails at one inch. The tuning fork applied to the calvarium, is heard more decidedly in the left, or diseased ear. The pharynx is reddened and the uvula elongated. The left membrana tympani is perforated antero-inferiorly, and has a small granulation projecting through the opening. Upon causing the patient to inflate by Valsalva's method pus is forced from the tympanic cavity, and the external auditory canal is bathed in pus. A small, slightly projecting red spot, on the upper part of the posterior wall of the auditory canal, very near the membrana tympani, attracted our attention, and upon further examination we found this to be the mouth of a fistulous opening through which the end of a bent probe could be easily passed into the mastoid antrum.

The ears were inflated by Politzer's method, and he was instructed to have the left syringed gently, three times a day with warm water.

The patient returned to us three weeks from the date of his first visit with some swelling and tenderness over the mastoid. He had not had any acute pain, but complained of a constant dull aching, "like the feeling produced by a boil." A free incision down to the mastoid, over an inch in length was made, but no pus was found. A tent was introduced and poultices applied, and he was sent home again to be under the care of his family physician. When he came to see us again in three weeks, the swelling and tenderness of the mastoid had passed away, the wound was healed, and the hearing distance had risen from nails 1,″ to nails at 8.″ The fistulous communication between the mastoid cells and the external auditory canal still persisted.

CASE VI.—*Acute inflammation of the middle ear, terminating fatally from brain complication.*

June 16th, 1875.—James M., æt. 60, manufacturer, states that he caught cold, last Friday, by getting wet in the excavation under the East River at Hallet's Point. The following night he suffered from pain and "pulsation" in his right ear. For the last two nights the pain has been so severe as to prevent sleep. The auditory canal is red and swollen in the vicinity of the membrana tympani, which is reddened, bulging, and distinctly pulsating. The Eustachian tubes are open. The watch is not heard in his right ear. The pharynx is red, the tonsils are swollen.

I punctured the membrana tympani and by inflation by Politzer's and Valsava's methods, considerable thick bloody matter was expelled from the tympanic cavity. Ordered frequent use of the warm douche, and an opiate to relieve the pain.

June 17th.—The puncture is healed and the drum-head is again bulging and pulsating. The pain, which was temporarily relieved, has returned. I repeated the paracentesis, again forced out through the opening the purulent contents of the tympanum by inflation, and ordered a leech to be applied half an inch in on the front wall of the meatus.

June 18th.—There is free discharge of pus, and there is still pulsation of the drum. The patient has neglected the leeching. Ordered to have two leeches applied to-day, one behind the ear, and one in the canal.

This gentleman soon after went away out of the city and placed himself under the care of another medical man, and died on the 18th of August, just two months from the date of his last visit to Dr. Agnew's office.

Although no autopsy was obtained yet the symptoms showed very plainly that his death was due to an extension of the ear affection to the brain.

CASE VII.—*Double acute otitis media, with inflammation of both external auditory canals, and both mastoid processes, supposed to have been caused by the use of the nasal douche.*

J. B. N., æt. 34, lawyer, states that on the first of January he had an attack of typhoid fever which was broken up by treatment after it had lasted just one week. He caught cold on January 10th, during convalescence, and had a severe nasopharyngeal catarrh. He used the nasal douche, with simple warm water, on the 10th, 11th, and 12th. His ears were very painful on the morning of the 13th, and he quit using the douche, believing the pain to be due to water extering his middle ears through his Eustachian tubes.

Inflammation of his left mastoid process set in, and he was confined to his bed for ten weeks. He was delirious for the first five days.

He has, at present, May 14th, inflammation of both external auditory canals, completely hiding from view both membrana tympani. The skin over both mastoids is reddened, and there is a tender point at the antero-inferior portion of each. The Eustachian tubes are probably open as Valsalva gives great pain. The pharynx is reddened and granular, and there is considerable discharge from the nares. Hearing distance, right, $\frac{7}{48}$, left, $\frac{1\frac{1}{2}}{48}$. Tuning fork heard equally well in both.

CASE VIII.—*Chronic suppurative inflammation of middle ear with mastoid complication—benefited by incision down to mastoid.*

Oct. 29th.—Miss Ada S., æt. 16, scholar, has long had discharge from right ear caused by scarletina. For the last four months she has had pain in the head and tenderness over the mastoid. She sometimes gets "so dizzy that she cannot see." She has constant pain or soreness over the right side of her head, through the temple and extending to the vertex. She hears the tuning fork in the right ear when applied to the head, but cannot bear the click of finger nails. The auditory canal is filled with pus, which being washed away, discovers a polypoid mass hiding the membrana tympani from view. The Eustachian tube is open, inflation producing a perforation whistle.

Nov. 1st.—Made incision one inch long, down to the mastoid. Free bleeding followed. Dressed with vaseline and absorbent cotton.

Nov. 6th.—Has had much less dizziness since the mastoid incision. The discharge from the ear has increased. Probed the wound throughout its length and dressed again.

Nov. 18th.—For more than ten days has had no pain in the head, and the dizziness occurs rarely, and only when she walks in the sun. Applied a blister of cantharidal collodion back of the cut.

Dec. 14th.—The hearing distance has increased from inability to hear the click of nails to $\frac{16}{48}$, and ability to hear words spoken in an ordinary tone of voice all the way across the room. She has kept up counter irritation with the blistering collodion. A granulation is springing up from the whole length of the cut. To allow the cut to heal, and to keep the ear cleansed with a solution of carbolic acid. She complains no longer of dizziness or headache.

This case is remarkable for the improvement in the hearing which took place under treatment, and the rapid improvement in the symptoms which followed the cut through the mastoid periosteum.

CASE IX.—*Acute inflammation of the middle ear with labyrinth complications, caused by the use of the nasal douche.*

D. S. G., æt. 41, musician, has been troubled with nasopharyngeal catarrh for three years, during which time he has used the nasal douche, as ordered by his physician, but not daily. The first trouble he ever noticed with his ears was about a year ago, when he observed that the air whistled through his left ear while blowing his nose. He has never had any discharge from either ear, and only slight tinnitus until the present acute attack. About ten days ago he used the nasal douche for the last time. The application gave him a violent pain in the left ear, and this continued until relieved by the application of six leeches, three behind and three in front of the ear. The singing and roaring noises have been very annoying since the commencement of the trouble. For the first eight days he heard everything a second time, like an echo from a great distance. A piano in good order sounds horribly out of tune to him.

Status præsens.—Hearing distance, right, $\frac{30}{48}$; left, $\frac{4}{48}$. Tuning fork applied to the skull, heard more in left than right. Pharynx hyperæmic, nares dry, external auditory canals normal. Left membrana tympani reddened along the handle and at the periphery, and sunken.

This patient was thoroughly inflated by Politzer's method, but did not return for further treatment.

CASE X.—*Subacute inflammation of the middle ear from the use of the nasal douche.*

H. C. W., æt. 31, lawyer, has been troubled with catarrh for a long time and has used the nasal douche for several years. When he used it the last time, several days ago, he felt the water enter his right ear. The ear has felt very sore and disagreeable since, but he has had no real pain. There is no tinnitus. He has long been in the habit of trying to relieve an itching sensation in his auditory canals by scratching them with a hair pin.

Hearing distance, right, $\frac{15}{60}$; left, $\frac{60}{60}$. The tuning fork in contact with the head is heard more in the right ear. The pharynx is granular, and the external auditory canals are somewhat obstructed by exfoliated epidermis. The right membrana tympani is reddened, and shows no light spot. The Eustachian tubes are open.

This case was treated successfully by leeching and inflation by Politzer's method. It is remarkable only for the mildness of the inflammation caused by the entrance of water into the ear through the Eustachian tube.

CASE XI.—*Acute inflammation of the middle ear apparantly caused by rupture of the drum-head while blowing the nose.*

S. P. W., clerk, æt. 24, states that on Friday morning, while blowing his nose, something seemed to give way in his ear, and the air whistled through. The ear became painful at once, and the pain continued until bed time. He experienced the same sensation on blowing his nose on Saturday morning, and he has had severe pain in the depths of his ear ever since. This morning (Monday), it commenced running, but is still painful. The pain is less severe when he is quiet. He has considerable tinnitus, and hears the watch only in contact. The turning fork is heard more in the painful ear.

The left external auditory canal contains pus, the membrana tympani is reddened, swollen and perforated, the air whistling through, and the pus bubbling out, on inflation by Valsalva's method.

He was treated successfully by leeching, the warm douche, and inflation.

Although the patient believed that violently blowing his nose was the first cause of the trouble, I think it more probable that there already existed a painless otitis media, and that the drum-membrane was already ulcerated and ready to burst when the forcible entrance of air through the Eustachian tube completed the perforation, and thus gave an impetus to the pre-existing inflammation, producing the severe pain.

CASE XII.—*Subacute inflammation of the middle ear with fluid in the tympanic cavity—puncture of the drum-head—recovery.*

May 19*th.*—B. N. F., æt. 51, farmer has had for the last three months, a crackling or ringing noise in his left ear which interferes seriously with his comfort. It originated in a cold which he caught in February. Occasionally he has slight pain which he refers to the tragus. He states that he had a similar attack twenty years ago from which he recovered without treatment. His voice is a little hoarse, and his throat the seat of a follicular pharyngitis. There is a copious secretion from his nares. Hearing distance, right, $\frac{8}{60}$; left, $\frac{2}{60}$. The tuning fork is heard better in the left ear. Both Eustachian tubes are pervious. The left membrana tympani is of a dirty yellowish color with a light spot of normal shape, but of diminished brilliancy. Upon inflation, air bubbles were seen through the membrana tympani rising slowly and bursting in the upper part of the cavity. The drum-head was punctured and air was forced through, carrying along with it a quantity of Malaga-grape colored fluid, enough to trickle out of the meatus. Half an hour later the noise had ceased and the hearing distance had risen to $\frac{6}{60}$.

May 23*d.*—There has been no tinnitus since; there is no evidence of fluid in the tympanic cavity; the hearing remains at $\frac{6}{60}$.

I saw the patient about two years later and he stated that there had been no recurrence of the ear trouble.

CASE XIII.—*Subacute inflammation of the middle ear, with fluid in the tympanic cavity—relieved by puncture of the drum-head.*

Mrs. J. S., æt. 50, had a roaring in the right ear last winter, which passed away after a short time, but returned about a week ago. Never had pain, or discharge from the ear, but there has been some dulness of hearing. Sometimes she can hear as well as ever with the right ear when lying on her back.

Hearing distance, R. watch in contact, L. normal. Tuning fork heard only in R. Chronic pharyngitis. The lower part of the right membrana tympani has a yellowish look ; the head of the stapes can be seen indistinctly ; the light spot is very large, but not bright.

Air seems not to pass into the ear by Politzer's or Valsalva's method.

As the history of the case and the appearances of the membrana tympani led us to suspect that there was fluid in the tympanic cavity, Dr. Agnew punctured the drum-head. Immediately on puncturing a bubble of air was seen in the cavity, but we could not blow either air or fluid through the perforation by Politzer's or Valsalva's method or by the Eustachian catheter. The use of Siegle's otoscope was then resorted to, and by making powerful suction while the patient endeavored to force air through his Eustachian tubes by Valsalva's method a comparatively large quantity of mucilaginous, Malaga-grape colored fluid was expelled. More of this fluid was afterwards expelled by Politzer's method, amounting to about one drachm in all. Before the patient left the office the hearing of the ear had gone up to $\frac{6}{48}$.

The large quantity of fluid evacuated in this case is conclusive evidence that the mastoid cells as well as the tympanic cavity were filled with it.

CASE XIV.—*Subacute inflammation of the middle ear with fluid in the tympanic cavity—relieved by puncture of the drum-head.*

L. A. W., æt. 27, baker, had his first spell of deafness and earache at the age of fifteen. Again, two years ago, he had a great deal of roaring noise in the left ear. This lasted for six or eight weeks, but passed away after inflation of the ears by Politzer's method. Last winter he had the same roaring and deafness for about two months, but got well without any treatment. The present attack came on about the first of August, got better without treatment, but now, Dec. 3d, is worse than ever. There is a constant noise in the left ear like the sound of a cataract. Up to two or three days ago this noise entirely disappeared on lying down. Now, with head erect the hearing is $\frac{6}{48}$, with the head thrown back, $\frac{36}{48}$, but the noise still continues. The drum-head looks reddish, but no air seems to enter the middle ear on the use of Valsalva's or Politzer's method.

This being a clear history of fluid in the cavity of the tympanum, Dr. Agnew, by means of a narrow Graefe's knife, incised the drum-head from the end of the handle of the malleus to the infero-posterior margin. Still, the patient could not expel any fluid or air by Valsalva's method, but by a forcible use of Politzer's method, at least five or six drops of Malaga-grape colored fluid were expelled. Immediately after, the hearing rose to $\frac{36}{48}$ with head erect. The patient said that the noise was so diminished that it felt like another ear. He was told to syringe the ear with warm water, but the following evening syringed it by mistake with a solution of Bichcloride of Mercury (gr. vi., ad. ℥ i.). This caused smarting at the time, and he had severe, burning pain in the ear for several minutes. The next morning the wound in the drum-head was found closed, but was reopened by forcible inflation. Three days after the operation, the patient heard the watch five feet with each ear. He stated that the ear which had contained the fluid felt, in every respect, as well as the other.

These cases of chronic or subacute inflammation of the middle ear with fluid exudation in the drum are not very common. I have seen several, however, besides those reported above, and they all, so far as I know, terminate favorably, after ridding the tympanic cavity of its fluid contents. In one case which I treated at the Manhattan Eye and Ear Hospital, the inflammation took an acute form after the puncture, and there was a discharge of pus for some weeks, but the inflammation eventually passed away leaving useful hearing.

Cases of acute inflammation of the middle ear, with the drum filled with pus, are met with much more frequently ; and in many such cases it is good practice to anticipate a perforation by puncturing the drum-head. I adduce a few cases.

CASE XV.—*Acute inflammation of the middle ear treated by puncture of the drum-head—recovery.*

March 9th, 1875.—S. H., æt. 60, sashmaker, states that his right ear has been deaf since childhood. On the 28th of February he came home from church deaf in his left. He was soon attacked with pain behind and in front of the ear, and much noise and throbbing in the ear. The same night there was a discharge of bloody matter upon the pillow.

Hearing distance $\frac{2}{60}$ in each ear. The right membrana tympani is sunken and cicatricial, the left is reddened, swollen and bulging.

Punctured the drum-head, and by inflation by Politzer's and Valsalva's methods, expelled a considerable quantity of bloody, whey-like fluid.

The ear recovered in a week or ten days under leeching, warm syringing and inflation.

CASE XVI.—*Acute inflammation of the middle ear with pus in the tympanic cavity—puncture of the drum-head—recovery.*

May 22nd.—P. C., æt. 35, laborer, caught cold in his head and has suffered from severe pain in his left ear for twenty-four hours. The ear hears a watch in contact, and the tuning fork, placed in contact with the head, better than the right ear which is normal. The left mastoid is tender to the touch, and the membrana tympani is red, swollen, and has three bleb-like elevations upon its surface.

A free incision was made through the drum-head, posterior to the malleus handle, and several drops of thick pus were expelled by inflation.

May 23d.—The patient states that he has had no pain in the ear since incision was made. He is still able to expel pus by Valsalva's method.

The ear recovered rapidly from this time.

CASE XVII.—*Acute inflammation of the middle ear with pus in the tympanic cavity—drum-head punctured thrice—recovery.*

March 17th.—Miss B. L., æt. 25, waitress, states that nine days ago, while suffering from a cold and a sore throat, pain came on in the left ear and she has suffered more or less acutely ever since. There is a roaring noise in the ear, whose hearing is reduced to $\frac{\frac{1}{2}}{48}$, and in which the tuning fork is heard better than in the normal ear. The drum-head is red, swollen, and bulging, and the back wall of the auditory canal is red, swollen, and ulcerated. Eustachian tubes open.

After puncturing the drum-head the patient forced air through his Eustachian tube, expelling pus from the drum, and producing the "perforation whistle."

March 18th.—The incision has healed; punctured again, and expelled more pus from the drum by Politzer's method.

March 19th.—The wound is again healed, and the drum-head bulging. Punctured a third time, and expelled pus as before.

March 20th.—Free discharge of pus from the ear; air is easily forced through the perforation; the boggy spot on the back wall of the canal has disappeared.

March 30th.—The discharge has ceased, and the noise is again troublesome. The patient also complains of headache, dizziness, and pain back of the ear.

Two leeches were applied half an inch in on the front wall of the ear, and the warm douche used frequently.

April 6th.—The headache and pain over the mastoid have disappeared, and there is now only occasional tinnitus. The membrana tympani is only slightly red, and the hearing has increased to $\frac{8}{48}$. The patient suffered no relapse after this.

EXTENSIVE CASEOUS OSTEITIS OF THE MASTOID PROCESS AND PETROUS BONE, CAUSED BY CHRONIC PURULENT INFLAMMATION OF THE MIDDLE EAR.—OPERATION.—PERMANENT FISTULA OF THE MASTOID—RECOVERY.

By A. G. GERSTER, M.D.

Surgeon to the German Hospital and Dispensary, New York.

The following successfully operated case of mastoidal abscess is cited to encourage others to prompt action in similar instances.

Jan. 14*th*, 1879, F. B., æt. 25, an emaciated German laborer was admitted to the German Hospital. He presented symptoms of a profusely purulent and fetid discharge of the right ear, dating back to infancy. For two years past numerous abscesses had formed about the mastoid process, and after being opened, they never healed. Being subject to constant headaches, sleeplessness and frequent attacks of fever, the discharge meantime becoming intolerably putrid, he finally sought to obtain relief from a physician in Jersey City, who performed Wilde's incision. The severity of the symptoms subsided only for a short time, and the patient at his admission was anxious to undergo any operation that would offer him a chance of recovery. Inspection revealed facial paralysis on the right side, and considerable sclerotic thickening of the soft integuments of the mastoid region ; also three fistulous openings surrounded by flaccid, unhealthy granulations, through all of which a probe passed readily into the body of the mastoid process, where diseased bone could be felt. The functional ability of the organ, both as regards conduction by air and bone, was totally destroyed.

Jan. 21*st.*—By a C-shaped incision of five inches and a-half, the bone was exposed in the whole extent of the postaural region. Ligatures being out of question on account of the rigidity of the integuments, the profuse hemorrhage was controlled by digital compression. Then the periosteum was detached and the edges of the wound were held apart by sharp hooks. Near the centre of the surface of the mastoid process we found a small opening the size of a pea, leading into a cavity filled by very offensive caseous masses. By the aid of a chisel and mallet, this opening was sufficiently enlarged to admit the index finger. The apex of the process was found to be attached to its base by a mere lamina of bone ; this was broken off and severed from the sterno-mastoid muscle. Thus an astonishingly large cavity was exposed ; it penetrated into the petrous bone forwards and inwards an inch and a quarter, and was estimated to be somewhat larger than a pigeon's egg. Its walls were perfectly smooth and hard, with the exception of the margin of a good sized communication existing between the middle ear and the mastoid cavity, where carious bone could be felt. All the pathological deposits were now removed by the aid of a scoop, and a stream of a solution of carbolic acid, directed into the meatus, returned readily through the newly established ostium. On inspection it was ascertained that only rudiments of the membrana tympani existed. At the upper and inner side of the roof of the mastoid cavity, a fissure-like opening could be seen which obviously led towards the labyrinth. All the fistulæ in the soft integuments were divided, among them one situated parallel with, and behind the sterno-mastoid muscle, reaching downwards an inch and a half ; some caseous glands in this neighborhood and the flabby granulations were vigorously scooped out, then, the bleeding was staunched by plugging with Lister's gauze, and the wound was antiseptically dressed.

No reaction followed the operation ; the patient's temperature never rose above 101.0° F., the first week, and always remained normal afterwards ; his headache and sleeplessness disappeared entirely, so that he could rest well without the aid of narcotics for the first time in a year. The third day after the operation the secretion became putrid owing to a fault in the dressing. A one per cent. solution of acetate of alum was substituted for the carbolic acid, the latter failing to deoderize the wound ; the cavities were irrigated every two hours, and two days later the foul odor disappeared and healthy granulations formed. Excepting where it was purposely kept open by a drainage tube, the incised wound healed kindly. *Feb. 28th.*—The *cavum tympani* and the cavity in the mastoid process appeared to be coated with a smooth, shining mucous membrane ; the fissure towards the labyrinth was firmly closed ; secretion minimal, and the general condition of the patient had improved remarkably.

It was observed in the course of the treatment that when irrigation was less frequently resorted to, the secretions of the middle ear, however slight, collected in the mastoidal cavity and were condensed to a cheesy substance. Therefore, to insure daily irrigation, it was decided to make the existing fistula permanent. A properly constructed silver *canula*, with a kidney-shaped flange, was inserted into the opening and is being worn without discomfort, merely secured by a fitting piece of *emplastrum cerussæ.*

Regarding the operative procedure, it may be said, that the use of such instruments as the trocar and trepan, the action of which cannot be kept under visual observation, is, to say the least, unsafe. The employment of the chisel and mallet seems to offer the greatest security. Several advantages will accrue if the action of the chisel is tangential to the surface of the cranium : *First*, the bone will be opened layer by layer, and thus laceration of the transverse sinus be best avoided ; *secondly*, the cavity of the abscess is converted into a shallow basin that will afford excellent drainage.

ON THE INDICATIONS OF OPENING THE MASTOID PROCESS IN CASES OF OTITIS MEDIA PURULENTA ACUTA WITH IMPLICATION OF THE MASTOID CELLS.

By Dr. EMIL GRUENING, of New York.

THE operation of perforating the healthy bony tissue of the mastoid process with the sole view of liberating purulent matter confined within its air-cells, has not yet been performed so frequently as to render the recorded material available in determining the exact conditions justifying the attack on the bone with drills or chisels.

In perusing the report of Schwartze's* very instructive series of fifty cases of perforation of the mastoid, I find eleven pertinent cases, and among the latter but two (Nos. 25 and 26) of acute otitis media purulenta resulting in the retention of pus within the mastoid cells.

Buck's† paper on "the diseases of the mastoid process, etc.," contains a number of interesting cases, of which, however, I can select but one, (Case XIV) as bearing upon the matter under consideration.

Our subject is the study of those cases in which from certain signs the presence of pus within the mastoid cells has been assumed and actually demonstrated.

That the indications for the perforation of the mastoid process are not precisely formulated, is evident from the fact that the able and experienced advocate of the operation, Schwartze, has been repeatedly deluded in his expectation of finding pus. For our purpose it is of little import that the revulsive action (as Schwartze terms it) of the

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**Arch. f. Ohrenheilk.*, Vol. X, 1, 2, 3; Vol. XI, 2; Vol. XII, 2; Vol. XIII, 1, 4.

†*Archives of Ophthalmology and Otology*, Vol. III, No. 1, p. 173.

assailed bone seems to influence favorably the course of the disease; the fact remains that the operation undertaken with a view of finding pus did not accomplish its object. The consideration then that more clinical material must be gathered in order to find absolute indications prompts me to give an account of two cases of acute otitis media purulenta with extension of the inflammation to the mastoid cells, and accumulation of pus therein, necessitating perforation of the bone.

CASE I.—Michael Moses, æt. 32. The patient has always enjoyed good health. His hearing was unimpaired until August, 1874, when, after a sea-bath, he experienced a sensation of fulness and dull pain in his right ear. The pain, moderate at first, increased rapidly, and did not abate until several days later, when a profuse discharge of matter ensued. The patient did not place himself under my treatment until the otorrhœa, attended with headache, tinnitus and vertigo, had lasted four weeks. On examination the external auditory canal of the right ear was found filled with fetid pus, the removal of which exposed to view the slightly reddened but otherwise normal lining of the canal and a small perforation of the drum-head in its infero-posterior quadrant. Eustachian tube permeable. Ticking of the watch heard only by conduction through the bones of the head. The region of the mastoid process reddened, œdematous and painful on pressure. I ordered the application of five leeches to the mastoid process, and instillations of a one per cent. solution of zinc sulpho-carbolate, together with the internal administration of a dose of calomel and jalap.

The immediate consequence of the local depletion was a subsidence of the pain, while the tenderness on pressure over the mastoid seemed even increased. The improvement in the subjective symptoms was of short duration; twenty-four hours later the pain had recurred with increased intensity, and radiated from the mastoid process to the temples and the occiput. The discharge from the ear was scanty. I performed Wilde's incision, carrying it from the apex of the mastoid upward to the extent of one inch and a quarter, and found the bone perfectly healthy. The wound bled freely, and the patient experienced much relief. During the following night the pain recurred with great violence; the patient became delirious, had several rigors, vomited repeatedly and responded sluggishly, though coherently, to loud questions. Temperature (in rectum) 105.° At daybreak, October 11th, 1874, I proposed the immediate perforation of the mastoid process.

Dr. A. H. Buck, who had been called in consultation, agreed with me as to the necessity of opening the bone, and with the kind assistance of this gentleman and Drs. Blume and Munson, I performed the operation with a drill, placing it on a level with the upper wall of the meatus, in the immediate vicinity of the auricle. It is unnecessary to describe minutely the various steps of the operation, which differed in no wise from that practiced formerly by Schwartze and Buck. The outer shell of the bone measured but 3 *mm.* in thickness, and a few rotations of the drill sufficed to lay open the antrum mastoideum, and give exit to a considerable quantity, about two teaspoonfuls, of creamy, inodorous pus. A probe introduced through the perforation encountered no dead bone, but transmitted the sensation of a perfectly smooth cavity. On irrigating the mastoid cells, it was found that the communication between the latter and the tympanic cavity was obstructed, inasmuch as the water did not escape either through the Eustachian tube or the outer ear.

Immediately after the operation the patient felt considerably relieved. His intellect was unimpaired. Temperature 101°.

At the next irrigation the following morning, the water escaped both through the outer ear and the Eustachian tube. On the fifth day the patient was up and free from all headache and dizziness. The otorrhœa soon ceased, but the hole in the drum-head did not close. Three months after the operation the patient could hear the ticking of the watch at a distance of one foot.

At the site of the operation a fistulous opening remained, which closed two years later, after the extrusion of several fragments of bone.

CASE II.—Louis Baer, æt. 42, musician, came under my care on the 13th of April, 1877, suffering with otitis media purulenta. The patient, who has been affected with phthisis pulmonum for several years, states that a few weeks ago he was seized with a violent earache, followed by a purulent discharge from the left ear, and impairment of hearing. A few days ago the pain in the left ear returned, attended with nocturnal exacerbations.

Present condition: On removing the purulent accumulations obstructing the canal, a large perforation of the drum-head is seen in its infero-anterior quadrant. The deeper portions of the external auditory canal, especially the posterior half of the roof, are markedly congested, bulging, and very tender on pressure. The mastoid process is œdematous, swollen and tender. Ticking of the watch audible on left side only when closely applied to ear; on right side at a distance of three inches.

The application of five leeches to the mastoid process was followed by considerable abatement of the headache for a few hours, after which time it returned with increased intensity.

On the 14th of April, after thoroughly cleansing the auditory canal, I made an incision through the skin and the periosteum of the mastoid process. The wound bled freely, and the patient obtained considerable relief for several days. The pain returned on the 17th of April. Inspection of the external auditory canal showed the same conditions as previously. I now made a free incision through that portion of the upper wall of the external auditory canal which adjoins the drum-head; found the bone rough, and, by firm pressure with a probe, succeeded in penetrating through the same into the mastoid cells and liberating a considerable quantity of thick pus. The patient at once experienced great relief; the pain disappeared completely, but again returned in three days with increased severity. I could still pass a curved probe from the external canal into the mastoid cells, but only by forcing a passage through the granulations which now obstructed the opening. The withdrawal of the probe was followed by free hemorrhage, which gave so much relief to the patient that I renewed the procedure several times at the same sitting. The following day a repetition of the probing did not cause any abatement of the pain. Patient screamed and groaned constantly, and complained of occipital headache. *T.* 102°, *P.* 120.

I now determined to perforate the mastoid process. The periostreum and the external shell of bone appeared perfectly healthy. The mastoid cells were perforated with a drill without appreciable difficulty, and about a teaspoonful of pus was evacuated. On introducing the probe I encountered a piece of loose bone, which had very probably been pushed in from the external auditory canal. Having enlarged the opening in the bone with a conical drill, I removed the fragment of carious bone. On irrigating the cavity of the wound, the water found its way out through the external auditory canal, washing away some pus and caseous particles. The immediate result of the operation was very satisfactory. At the end of two months the otorrhœa had ceased and the mastoid wound had cicatrized.

From the meagre statistics at my disposal I cannot draw conclusions of general applicability, and shall therefore content myself to indicate the features common to both cases, and thus try to aid in establishing more precise indications for the opening of the mastoid process. In the two cases of acute purulent otitis media, attended with high fever, the inflammation spread to the mastoid process which presented redness, swelling and great tenderness, and moreover, became the seat of violent pain, radiating towards the temple and occiput. Application of leeches to the mastoid and Wilde's incision caused but little improvement, inasmuch as the febrile condition persisted and the pain recurred speedily. Perforation of the mastoid process was followed by evacuation of pus, great relief and rapid recovery.

REPORT ON THE PROGRESS OF OTOLOGY.

IN THE FIRST HALF OF THE YEAR, 1879.

I. NORMAL AND PATHOLOGICAL ANATOMY AND HISTOLOGY OF THE ORGAN OF HEARING.

By H. STEINBRUEGGE, of Heidelberg.

Translated from the German edition, by Isidor Furst, New York.

1. Kleine Beiträge zur normalen and pathologischen Anatomie des Gehörorgans. [Minor Contributions to the Normal and Pathological Anatomy of the Organ of Hearing.] By Dr. K. Buerkner, of Göttingen. *Arch. f. Ohrenheilkde.*, 1878, Bd. XIII., Heft 2 and 3.

2. Dritter Beitrag zur Anatomie des Schläfenbeins. [Third Contribution to the Anatomy of the Temporal Bone.] By Dr. E. Zuckerkandl. *Monatschrift f. Ohrenheikde.*, Nos. 3 and 4.

a. On Atrophy of the Petrous Bone.

b. On a Typical Formation of Fissure in the Posterior Wall of the External Auditory Meatus.

c. Fourth Contribution to the Anatomy of the Organ of Hearing. By the same Author. *Monatsschrift f. Ohrenheilkde.*, 1878. No. 7.

3. Zur Kenntniss der sogenannten Dehiscenz des Tegmen Tympani. [Contribution to the Knowledge of the so-called Dehiscence of the Tegmen Tympani.] By Dr. Max Flesch, Demonstrator of Anatomy in Würzburg. *Arch. f. Ohrenheilkde.*, Bd. XIV, Heft 1.

4. Case of Abcess of the Cerebellum, bursting into the Ear, with Immediate Death. By G. C. Gribbon. *Lancet*, 1878, Bd. I., No. 20.

5. Ueber das Vorkommen und die Bedeutung phosphorsaurer Kalkconcremente im Stamme des Gehörnerven. [On the Occurrence and the importance of Concretions of Phosphate of Lime in the Trunk of the Auditory Nerve.] Lecture read at the meeting

of Southwestern German Neurologists and Physicians for the Insane, at Wildbad, May 20th, 1878, by Prof. Dr. Moos.

6. Mangel der Halbzirkelgänge im rechten Felsenbein bei einer Taube. [Absence of the semi-circular Canals in the Right Petrous Bone of a Pigeon.] By H. Munk. *Arch. f. Anatomie u. Physiologie*, Jahrg. 1878, Physiol. Abth., 3d and 4th Heft. Session of the Physiol. Society at Berlin, July 11th, 1878.

Buerkner (1) contributes researches on the fissure in the ossification of the external auditory meatus, on the dehiscences of the tegmen tympani, as well as on an isolated cartilage in the infantile auditory meatus. Regarding the fissure of ossification, the statements of earlier anatomists who have touched on the subject (Riolan, Du Verney, Casselbohm, Lincke, Huschke are cited); while others, Blummenbach and A. F. Günther do not appear to have recognized it. Hymphry first correctly described the formation of the external auditory meatus and the fissure; Hyrtl distinguishes between the fissure owing to the motions of the head of the ramus of the inferior maxillary bone and those depending on imperfect ossification; and Toynbee in his Catalogue enumerates six temporal bones with this defect. Thorough researches on this subject were subsequently published by v. Tröltsch and Gruber, and lately by Rüdinger and Zuckerkandl. The latter describes the formation of excrescences on the annulis tympanicus, the so-called tubercula tympanica antica and postica, which, converging externally, unite at their apices, whereby a fissure-like opening is formed below, which is said to persist up to the seventh year. Anatomists differ as to the time of closure. Bürkner's researches comprise the large number of 1178 skulls of different races, belonging to the collections of Würzberg, Dresden, and Frankfort (Senkenberg's) Of 332 of these, the age was given; of 91, it could be definitely, of 775 only approximately determined. The appearance of the tubercula tympanica is not confined to any one fœtal month; but, as is shown by an appended table of 118 infantile skulls, cannot be demonstrated before the seventh fœtal month; while the numbers vary in the months of the first year of life, and reach the highest figure at its end. The posterior tubercle appears later, but grows more rapidly (Rüdinger). The completion of the fissure seems to fall in the second year; its shape is very variable, but the oval or crescent shape, with a larger transverse and a smaller longitudinal diameter, predominates. By furcation of the tubercles, several fissures may form, or, when the excrescences do not meet, fissures with greater longitudinal diameter. The defect is mostly bilateral. Shape and size of the fissures vary greatly and admit of conclusions as to the age of the individual. As regards the closure of the openings, a tabular statement proves that they become more rare from the fifth year, but the author still found 37.5 per cent. in the fifteenth year, including the unilateral defects. He further saw, among 982 skulls of adults, 19.2 per cent. showing partly unilateral, partly bilateral fissures, 12.5 per cent. of which undoubtedly dated from infancy, and could not have been owing to friction or other mechanical causes. The size of the fissures of ossification in adults is smaller than in children, their form more angular, their rim less serrated. Their frequency is in inverse ratio to the age. The middle age yielded 17 to 18 per cent. Then follows a table of 1060 adult and infantile skulls, placing together according to age the cases of unilateral, bilateral, and absent fissures. This table proves that unilateral fissure predominates, and, moreover, that neither side seems to preponderate particularly. Further tables show an overbalance of the fissures in number and size in the female sex. No material difference could be demonstrated in one or the other race as to frequency of occurrence.

In contradistinction to the rounded and solid appearance of fissures of ossification, the author then points out the crumbling and corroded aspect of a carious defect which was found in a left auditory meatus accompanying caries of the cochlea.

Bürkner, then, in a second section, turns to the discussion of the dehiscence of the tegmen tympani. Cassebohm, Toynbee, Hyrtl, v. Retzino, v. Tröltsch, and others mention its occurrence; but respecting its formation a difference of opinion prevails, to which we shall recur at another place. Bürkner observed a frequent coincidence of pronounced *impressiones digitatæ* with dehiscences of the tegmen and other thinnings of the skull. Among 44 skulls showing perforations of the roof of the tympanum, 36 contained extensive impressions, and in 32 the orbitæ were partially thin, partially perforated. The author concludes that absorption of the respective plates of bone takes place through pressure exerted by the brain, which pressure, however, cannot be more nearly defined. The form and quantity of the fissures vary; their most frequent occurrence is above the head of the malleus, and somewhat farther toward the sutura petroso-squamosa.

In a third section he reports concerning a narrow, isolated cartilage in the auditory meatus of a one-year-old child, subsequently also found in five other infantile cadavers of from three weeks to one and a half years of age. This cartilage is shaped like a hook, from one to one and a half centimetres long, and is situated at the anterior inferior wall in the membranous tissue forming the continuation of the cartilaginous auditory meatus. At times it is not fully isolated, but partly grown into the outward-pointing cartilage, leading the author to the belief that this is a preformation of Santorini's incisure. Two plates, containing drawings of petrous bones by the author, are appended to the text.

According to Zuckerkandl (2 *a*), the origin of atrophy of the petrous bone is favored by intracranial pressure caused by hydrocephalous, hypertrophy of the brain, as well as by early synostosis of the sutures. Accompaning this condition, the bones of the skull are found thinned ; the impressiones digitatæ, deep ; the juga cerebralia, high and angular. Zuckerhandl distinguishes four degrees of atrophy of the petrous bone. The first shows the upper surface smooth and thin ; the semi-circular arcs project as distinct ridges. The second degree is characterized by a greater convexity of the posterior surface, as the bony tissue before and behind the internal auditory meatus atrophies considerably, thereby obliterating the anterior limiting edge of the fossa sigmoidea. In the third degree of atrophy, the convexity of the posterior wall has increased still more; the region of the semi-circular canals forming the limiting edge of the sulcus. Finally, in the highest degree of atrophy, the background of the meatus auditorius internus is fully exposed ; the sagittal and frontal semi-circular canals become very prominent and show dehiscences. Senile atrophy of the petrous bones, as well as that caused by hydrocephalus, only lead to the lighter degrees. In all cases, the posterior surface of the petrous bone is most deeply affected.

Zuckerkandl (2 *b*), found formation of fissures in the posterior wall of the auditory meatus in three petrous bones. In the first, the fissure extended through the whole length of the wall, leading into the cavity of the tympanum and into the cells of the mastoid process. The second preparation was in a similar condition. In the third, the fissure, widening toward the interior, extended to the limit between the external and middle third of the auditory meatus, and led into the upper cells of the mastoid process, all three petrous bones lacked the spina supra meatum. Zuckerkandl takes the fissure-formation to be congenital, and refers it to a persisting patulous condition of the juncture of the *épitympanique* (as the French call it) with the squama of the temporal bone.

(2 *c*) 1. Description of the left petrous bone of a new-born showing several traces of arrested development. The Fallopian canal extended as an open furrow to the second flexure, then formed a sinus open toward the cavity of the tympanum, and finally formed a sulcus ending at the foramen stylomastoideum. The passage of the acusticus commenced as a small fissure and ended with a tractus foraminulentus, which corresponded only to about one-third of the normal size. The tympanic cavity showed no foramen ovale, no promentorium, no eminentia pyramidalis, but only a cavity in the wall of the labyrinth, at the bottom of which there was a fissure-like opening into the cochlea. The latter, as well as the vestibule, are only half the size of those of the new-born. From within the vestibule may be seen a thin plate of bone, plainly differentiated, corresponding to the plate of the stapes, surrounded by a delicate white wall, as if a synostosis of the plate of the stapes with the wall of the labyrinth had taken place. The author refers to Rüdinger's and Gruber's investigations concerning the formation of canals in the temporal bone, and the development of the stapes from the wall of the labyrinth, and hence considers the present case as one of arrested formation.

2. Absence of calibre of the external auditory meatus and the cavity of the tympanum in the right petrous bone of a man aged 40. The occluding bony mass contained inferiorly a small fissure leading into a canal 1 *cm.* long, 2 *mm.* broad, and 2 *mm.* deep. Abscence of membrana tympani, ossicles, and canal of the tensor tympani; the bony canal of the tube was present to the length of 1 *cm.* The bony labyrinth was normally developed.

3. Considerable stenosis of the fenestra rotunda in both petrous bones of a man. The fenestræ would only admit the introduction of a bristle. In place of the eminentia pyramidalis a deep cavity, communicating with the Fallopian canal was found. The temporal region, situated behind the sulcus tympani, was greatly swollen and overlapped the sulcus anteriorly, so that Zuckerkandl thinks an otoscopical diagnosis of this bony prominence possible.

(3.) Referring to the investigations of Bürkner * and Jänicke,†

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* *Archiv. f. O.*, Bd. XIII, p. 125.

† Contributions to the Anomalies of the Base of the Skull. On Thinning and Perforation of the Tegmen Tymp. Inaug. Diss., Kiel, 1877.

Flesch states that these authors agree on the frequent concurrence of dehiscence of the tegmen tympani with thinning and perforation in other parts of the skull. While Bürkner, however, assumes as cause, in the greater majority of cases, pressure exercised by the brain, Jänicke considers most of the defects as congenital, a large number as due to senile atrophy, and saw in one case thinning of the tegmen as well as of the base of the skull due to a high degree of hydrops ventriculorum with closure of all cranial sutures. Hyrtl's hypothesis, that pregnancy, as well as frequent blowing of the nose, favor dehiscence, is stated by Jänicke as improbable; likewise, its frequent origin in Pacchioni's granulations. Subsequently eleven macerated skulls, or their petrous bones, from the Würzburg collection are described, concerning the details of which the original should be consulted. The author then turns to the consideration of Jänicke's assumption, that the dehiscences are mostly congenital. The small percentage (7.6) between the ages from one to twenty years,‡ given by Jänicke, contradicts this theory; the percentage in later years rising to from three to five times that number. Flesch examined 61 temporal bones of the new-born, and found in but one of them three somewhat larger apertures, disregarding as foreign to this subject the segmentation of the point of the tegmen tympani into an intercalary bone. The roof of the cavity of the tympanum, besides, does not belong to the absorption-surfaces of the temporal bone (Kölliker), but appears to the author to be classifiable among the opposition-surfaces, judging from some experiments of feeding animals on madder. Hence, any fissures occurring in infancy would be closed later, and the percentage of dehiscences should diminish rather than increase with age. Flesch agrees with Jänicke respecting the simultaneous occurrence of fissures with expansion of the frontal and other pneumatic cavaties; while he dissents from Hyrtl's hypothesis regarding pregnancy. Perforations caused by Pacchioni's granulations seem to occur rarely in the tegmen itself, inasmuch as they rarely cross the fissura petrosa-squamosa. The effects of pressure, then, would seem to be the most frequent cause of perforations. The roof of the orbital cavity and the lamella above the malleo-incudal joint are particularly exposed to pressure, on account of the vicinity of firm structures not permitting an apposition from within the cavities, which might counterbalance the absorption by intracranial pressure. Result : 1st. The dehiscences are the consequences of processes of absorption, and certainly only in exceptional cases congenital. 2nd. In the large majority of cases, increase of pressure within the cranial cavity is the cause of the absorption. 3d. Extensive development of the pneumatic cavities favors the consummation of the perforation.

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‡ Jänicke says, however, that the majority of instances belonging to this class are new-born or very young children, in whom the whole pyramid is still but little developed and firmly attached to the dura mater, so that with them the condition of the tegmen tympani is difficult to determine.

Historical Supplement of the Reviewer.

For the sake of the historical interest, it may not be amiss in this place to remember Valsalva's views on the dehiscences.* Valsalva must have frequently seen them, for he inclines to consider them as normal apertures. Where he failed to see them, he often succeeded, by injections through the tubes, to force fluids through the roof of the tympanic cavity, and where even this no longer occurred he believed that the narrow canaliculi had been closed by mucus or the formation of valvules. After describing the fenestræ rotunda and ovalis, he says that he had discovered, besides these well-known openings, new apertures in the tympanic cavity, the situation of which would be found above the mastoid cells, predominantly above the malleo-incudal joint, but also more anteriorly. Although again doubting whether they had been intended by nature, on account of the frequent absence of the fissures, he still believes to have found a solution, very welcome to physicians, of the enigma as to how aggregations of blood or pus may gain egress from the cranial cavity, and in reference thereto, adduces the results of two autopsies. In the fifth chapter he again recurs at length to the new foramina, discusses their advantages under normal conditions—namely, that the cerebral fluid flowing through them moistens the membrana tympani and thereby preserves its vibratory power ; further, that in penetrating wounds of the skull and the formation of abscesses, during the condensation of the air which has been named after him, pus flows more freely from the wound, respectively the auditory meatus ; and, finally, he recommends to physicians to apply inhalations in apoplectics to the nostril opposite to the paralyzed side. Morgagni † likewise treats fully of Valsalva's foramina, coinciding with his teacher, although he would limit their occurrence and advantages. Moreover, Hyrtl ‡ after speaking of the conduction of the inflammatory process from the tympanic cavity into the interior of the skull, says: "The apertures in the tegmen tympani, on the other hand, may cause intracranial abscesses to empty themselves into the tympanic cavity, and to reach the exterior through the disintegrated membrana tympani ." Valsalva is not mentioned in this connection.

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* A. M. Valsalvæ Tractatus de aure. Venetiis, 1741. Cap. II, 14.

† J. B. Morgagni Epistola anatomica, VI, p. 208.

Gribbon (4) describes a case of purulent otitis media dextra with destruction of the membrana tympani in a soldier, æt. 22, who complained shortly before death of violent headache, nausea, and weakness of the lower extremities. On raising the patient, there was a profuse discharge of pus from the right ear, followed by sudden death. On section, the cerebellum showed a large abscess cavity which had completely destroyed the right lobe, a thin membrane excepted, as well as the vermiform process and the left lobe in part. The perforation had occured in the region of the right meatus auditorius internus ; here the petrous bone and the mastoid cells were filled with pus. The abscess probably had existed for some time, but there were no symptoms present which could have indicated so grave an affection.

Böttcher (5) already proved in the twelfth volume of Virchow's Archiv. the frequent occurrence of concretions of phosphate of lime in the periosteum of the internal auditory meatus, said to be most frequent in its fundus. They are not to be looked upon as senile productions, but are found already in persons of middle age. They are homogeneous or concentrically laminated bodies, of globular, oval or club shape and whitish-yellow color. The bodies are homogeneous when they, situated at the inner surface of the meatus, are allowed free development and growth ; in the firm tissue of the periosteum they are surrounded by layers of connective tissue. Reaction on muriatic acid. Moos (5) found these concretions not infrequently. On dissection of a deaf-mute (ARCH OF OPHTH. AND OTOL., II, i. 139), they were found in the periosteum of the porus acust. int., in the neurilemma of the acusticus, and on the membranous saccules of both vestibules. Fester (clinical contributions to the Psammoma of the Central Nervous Apparatus, *Berl. Klin. Wochenschr.*, No. 8, 1878) describes three cases of fibro-psammoma, two of which concerned the acoustic and facial nerves. In the one case, the acoustic nerve was atrophic, in a state of fatty degeneration, containing concrements in the thickened neurilemma; in the second case, the nerve itself showed such deposits between the still remaining thin and atrophied fibres. The corpuscles could be traced into the cochlea and semi-circular canals, thus permitting conclusions as to the peripheral commencement of the neoplasm with centripetal development. Moos, on examining the petrous bones of a woman, æt. 44, accidentally found concretions of phosphate of lime in the body of both auditory nerves, while transverse sections of the same were examined for hemorrhagic infiltration of the sheath. Moos had examined the patient two years before. She was very hard of hearing, dated her affection three years back, could only converse by means of an ear-trumpet, and was excessively annoyed by subjective noises. Bilateral hyperæmia of the vessels of the handle of the malleus; tubes patent. Bone-conduction for watch and tuning fork no longer present. Suspected labyrinthine trouble. Further treatment declined, it having been fruitlessly attempted by others. Beginning of July, 1877, suicide by drowning. The report of the house physician showed that patient had suffered from insomnia, neuralgic pain in various parts of the head, as well as from hyperæsthesia of the scalp. Latterly, weakness of sight, injection of the conjunctiva. At times fever up to 39° C., exhausting hyperhidrosis. Section of the petrous bones by Moos: Mucous membrane of posterior wall of pharynx hyperæmic. Right tube with difficulty, left tubes easily permeable. Dura mater throughout firmly united to the hyperostotic petrous bone. Right, marked hyperæmia of the vessels of the manubrium and of the whole middle ear and the mastoid cells; some serum in tympanic cavity. Left, the wall of the labyrinth only hyperæmic. Internal muscles on both sides normal; malleo-incudal and incudo-stapedeal joints slightly movable; mobility of the stapes impaired. Vestibules narrowed by hyperostosis; membranous semi-circular canal satrophic. Numerous concretions of phosphate of lime in the neurilemma and the body of both acoustic nerves. The left acusticus, on transverse section, showed recent hemorrhages. Interstitial neurilemma thickened. Discrete concretions likewise in the lamina spiral. membran. of the left cochlea. Remarks: 1. The manner of death may perhaps explain the hyperæmia—excepting that of the left labyrinthine wall—as well as the hemorrhagic infiltrations. 2. The sclerosed condition of the petrous bones is a partial demonstration of the pachymeningitis proved by the house physician by the autopsy. 3. The sclerosis of the middle ear was the oldest metamorphosis, inducing impaired hearing and increased pressure in the labyrinth. 4. The subjective auditory sensations were materially increased by the development of concretions of phosphate of lime in the body of the acoustic nerve, inasmuch as these deposits must be regarded as pathological, continuously acting, mechanically tetanizing apparatuses.

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‡ On Spontaneous Dehiscence of the Tegmen Tympani and Cellulæ mast. Sitzungsbericht der Kaiserl, Akademic, etc., June 17th, 1858.

H. Munk (6) reports on a case of unilateral absence of all semi-circular canals in a pigeon—"turning" pigeon, so called. There was a faulty carriage of the head which appeared turned, as compared with the normal, 90° degrees around the sagittal axis, and 45° around the vertical axis toward the left. The right eye was directed straight downward, the left eye straight upward. The bill was turned to the left and anteriorly; the back of the head to the right and backward. This carriage of the head remained unchanged and quickly returned after forcible alteration. Standing and slow walking were normal. Walking was never performed in a straight line, but in a large curve toward the left, therefore *mouvements de manège* to the left Flying was impossible. In feeding, the pigeon struck to the left forward and downward. Under observation six months. Autopsy: Posterior muscles of neck normal. In the petrous bone, posteriorly to the right, there was a depression of 7–8 *mm.* in diameter. Bony wall thinner than normal. *No trace of semi-circular canals.* Left, everything normal. Tympanum and cochlea normal on both sides. No abnormity in the cerebellum and the processus mesootici. Acustici not yet examined at time of report.

According to Munk, only the faulty carriage of the head can be attributed to the abscence of the semi-circular canals as *primary* consequence. All other appearances are *secondary*, deducible from the faulty carriage of the head.

II. PHYSIOLOGY OF THE ORGAN OF HEARING.

By OSCAR WOLF, of Frankfort-on-the-Main.

Translated by Isidor Furst, of New York.

1. J. Gavarret, Professeur de la Faculté de Médicine de Paris. Acoustique biologique. Phénomènes physiques de la phonation et de l'audition. [Biological Acoustics. Physical Phenomena of Phonation and Audition]. Avec 100 Figures dans le texte. Paris: G. Masson, 1877.

2. Dr. Arthur Hartmann, of Berlin: "Eine neue Methode der Hörprüfung mit Hilfe electrischer Ströme." [A new Method of Testing the Hearing by the aid of Electric Currents]. *Archiv. für Physiologie* von E. du Bois-Reymond. Leipzig: Veit & Co., Jahrg. 1878.

3. Albert Wodtke, M.D., of Dantsic: "Ueber Hörprüfung mit besonderer Berücksichtigung der Methode mit Hilfe electrischer Ströme." [On Hearing-tests with special Reference to the Method by the aid of the Electric Current]. Inaugural Dissertation. Rostock: Universitäts-Buchdruckerei, 1878.

4. Prof. E. Berthold, of Königsberg: "Optische Darstellung der Schwingangen, welche durch das Telephon erzeugt werden." [Optical Representation of the Vibrations produced by the Telephone]. *Monatsschrift für Ohrenheilkunde*, June, 1878.

In the preface, wherein J. Gavarret (1) gives a definition of the object and contents of his book, he places the following sentence at the head: "The present publication, intended for our audience and pupils, is devoted to the study of the interesting question of biological physics. Without even for an instant straying from the experimental path or the elementary form, we have endeavored to maintain this monograph at *the level of science*."

Then follows a short synopsis of the contents of the several chapters: The first three treat of the origin and the propagation of sound waves, the velocity, refraction, and reflection of sound; further of musical intervals, the scale, partial tones, and the manner of vibration of gaseous, solid, and liquid bodies. The fourth chapter treats of the doctrine of interference of sound, and of the faculty of the ear to analyze composite sounds; the fifth chapter treats of the doctrine of resonance, the sixth of the timbre of tones; the seventh and eighth chapters contain studies on the physical and physiological phenomena of voice-formation and hearing (phonation et audition). If, in reading this work, we try to find out what M. Gavarret means by "level of science," we look in vain for anything new, in the whole book, or anything particularly valuable to the physiology of speech and the ear. The book is a compilation—we admit, a very clear and clever one—of various text-books of physics, and particularly of Helmholtz's "Lehre von den Tonempfindungen."

Although it may be very flattering to German investigators to be thus acknowledged by French authors, it is on the other hand to be regretted that so capable an academical teacher as Gavarret in the year 1877 only knew those works which had been translated into French up to the latter part of 1869. Hence the results obtained within the last ten years by Böttcher, Buck, Blake, A. Fick, Goltz, Lucæ, Mach, Magnus, Moos, Preyer, the Reviewer, and others, based on the publications of Helmholtz and Donders, must for the present remain unknown to the French reader. Illustrations and texts are chiefly borrowed from the following works: Joh. Müller, Manuel de physiologie, traduction de Jourdan, 1845; Helmholtz, Théorie physiologique de la musique, traduction de Guéroult, 1868; Tyndall, le son, traduction de l'abbé Moigno, 1869. The only thing new is the illustration of Scott's phonautograph (also used as vignette on the title-page) which, however, is already superseded by Edison's phonograph.

In the seventh session of the Physiological Society of Berlin, Dr. Arthur Hartmann (2) demonstrated "a new method of testing the hearing by the aid of electric currents," and Mr. Albert Wodtke, incited by this lecture, has followed with further investigations, the results of which he has laid before us in his inaugural dissertation. It would be more correct to call the method reported by Hartmann "testing the intensity of sound," and not "testing the hearing," for in the main it rests on the principle: "to measurably graduate the intensity of the sound produced by an apparatus."

This graduation Hartmann attempts to secure by the following arrangement: A regularly interrupted electric current is directed to a telephone, in which as many variations in magnetism, and consequent vibrations of the diaphragm, are induced as there are interruptions, producing on the applied ear the effect of a loud tone. The diminution of the current produces a lower, the increase of the current, a greater intensity of tone. The regular interruption of the current is effected by a Helmholtz's intermitting tuning-fork; the diminution, by a rheostat or by the aid of a sledge induction apparatus; the tuning-fork in question is maintained in vibration by two Daniell's elements. For the application of induced currents as telophone exciters, the interrupting fork is included in the primary circuit of a Du Bois-Reymond sledge-inductorium, whose secondary spirals are joined to the receiving telephone by wires of 20 metres in length; on removing the secondary spirals from the primary ones, the tone in the telephone decreases in analogy to the intensity of the currents.

Thus far Hartmann's communication.

Wodtke (3) sought to utilize Hartmann's idea for the purpose of otology, particularly the testing of the acuity of hearing, and accordingly modified the apparatus in the following manner. Considering that the current produced by the Daniell elements is generally of inconstant intensity, Wodtke used a thermo-electric chain, the current of which keeps the fork *uniformly* vibrating, as long as the flame heating the chain is always kept at the same height. The ear-piece of the telephone was modified in such a manner as to imitate the end-piece of the otoscope. This modification has the advantage of excluding bone-conduction in experiments with ear patients, for when the otoscope-like end-tube was closed above, and held to the temple, the mastoid process, or between the teeth, no tone was audible. For the graduation of the intensity of the tone the small sledge-inductorium was employed, whose secondary spirals could be separated from the primary ones to the distance of 57 centimetres. Opening and closure of the circuit afforded a ready means of preventing self-deception, and still more, to guard against false representations of patients during hearing-tests that were to be instituted. When the apparatus is in operation, its intensity of tone is proportionate to the square of intensity of the electric current. The hearing-tests were instituted in such a manner as to choose the greatest intensity of tone first, and then reduce this by removal of the secondary spirals from the primary ones, until the patient represented that he ceased hearing; then the distance of the secondary spirals from the primary ones was measured. Then Wodtke started from such a distance at which the patient was sure not to hear anything, and proceeded with the approximation of the secondary spirals to the primary ones until he came to the point at which the patient stated that he heard; then again the distance was measured, generally yielding a difference from the first determined distance.

Finally Wodtke made comparative experiments on 25 patients, between their perceptive powers for the tone of the telephone, the watch, and Politzer's acoumeter, yielding more constant results in favor of the telephone than with either watch or acoumeter.

Thus far the groundwork of Wodtke's facts. If we now consider his experiments in a theoretical direction, they at least yield the valuable result that by their aid the approximate measurement of the *intensity* of a tone seems to have been accomplished for the first time. This achievement being of importance for physical acoustics, it remains in so far significant for the physiology of the ear as it permits us to search out the perceptive capacity for the faintest tone. But when Wodtke says, at the end of his dissertation: "This assertion seems to me permissible, that this method, in which everything is based on law, which avoids the shortcomings attaching to so many other methods, is in the way of satisfying *every* demand made of a *satisfactory* acoumeter," then the Reviewer would desire to repeat the demands made by him some time ago (ARCHIVES OF OPHTH. AND OTOL., IV, p. 68), which the busy practitioner even to this day has to make of a hearing test sufficing for diagnosis and prognosis, namely: it must admit of quick performance, lest it take up too much of the time and patience of physicians as well as of patients; it must be accurate, *i. e.*, it must compass, if possible, the series of tones occurring in human intercourse; it must finally be so uniform and comprehensible as possible for all patients and for all repetitions of the test. Wodtke's method in question at best fulfils only the latter requirement, and this only if it should be possible *always to develop* an equally strong electric current. But the Reviewer must doubt even this; a thin layer of oxide at a place of junction weakens the current considerably; now let us imagine the physician examining the condition of the thermo-electric chain previous to his hours of consultation to enable him to make a hearing-test—it would take a great deal of time; nor would it be possible for him to take the thermo-electric chain and the intermitting tuning-fork with him to the house of his patient.

If we inquire further, what would be gained by testing according to this method, how distinctly a patient perceives a single tuning-fork tone, c°, and how its intensity appears changed after treatment? Hardly anything more than what the usual tuning-fork test shows. In all those alterations which exhibit an unequal perception for different tone-groups—and they are by far the most numerous—in all these, by the aid of the method described, we utterly fail to obtain a clear or precise representation of the affection.

But if we, instead of a Helmholtz's or König's tuning-fork (which latter was used by Wodtke), employed a whole series for hearing-tests, the acquirement and keeping in repair of so complicated an apparatus would be hardly possible to the practitioner. The Reviewer then cannot grant any material advantage to this method over that in use thus far (quantitative and qualitative test of speech, watch and Politzer's acoumeter), and he believes not to err in thinking its general introduction into practice improbable, however interesting the experiments of Hartmann and Wodtke may be in a theoretical point of view.

Prof. E. BERTHOLD'S (4) communication on the optical representation of the vibrations produced by the telephone is in so far in connection with the researches just discussed (2 and 3) as Wodtke made his investigations at Berthold's clinique, witnessing Berthold's experiments with the telephone. Berthold (4) hermetically joins the ear-piece of a telephone to a T-shaped glass tube. One of the three ends of this tube is within the tube attached to the ear-piece of the telephone; the second end is connected with a gas tube by an india-rubber hose, and the third end is drawn out so as to give a small vertical flame with the gas escaping from it. The well-known prismatic, rotating mirror serves for the observation of the flame; a quietly burning flame shows therein a horizontal line of light, whose breadth corresponds to the height of the flame. If now the conducting wires of the telephone were connected with an intermitting current, distinct wave-motions showed themselves in the rotating mirror, and these wave-motions became still more distinct on connecting a König's intermitting tuning-fork as tone-producer with the telephone. In these experiments the fact was surprising that the tones of a violin and of loudly articulated vowels spoken into the mouth-piece of the telephone, produced barely any alteration in the line of light, while they still remained very distinctly audible in the ear-piece of the telephone. For this reason Berthold employed this test for the experimental proof of *the degree of sensitiveness with which our ear reacts on tones;* he inserted a stopper-rheostat between tuning-fork and telephone, in order to cause the loud tone produced by the intermittent tuning-fork in the ear-piece of the telephone to disappear. It was thereby shown that it was not possible to entirely extinguish the tone in the telephone with a resistance of 2,110 Siemen's elements—the strongest possible, by means of the rheostat. But on observing the image of the flame in the rotating mirror during the insertion of rheostat, there was only a faint wave-line visible in the mirror, with a resistance of but 100 Siemens elements; with a resistance of 200 Siemens elements, only the band of flame was visible, but no motion thereof. Berthold concludes from this fact that *our ear* is more than *ten times as sensitive a reagent for tones than an ever so easily movable gas flame.*

(TO BE CONTINUED.)

III. EMBRYOLOGY AND COMPARATIVE ANATOMY OF THE ORGAN OF HEARING.

By L. LÖWE, of Berlin.

Translated by Isidor Furst, of New York.

1. O. Hertwig and R. Hertwig : Das Nerven system und die Sinnesorgane der Medusen. [The Nervous System and the Perceptive Organs of the Medusæ]. Leipzig : Engelman, 1878.

2. L. Löwe : Ueber Entstehung des knorpeligen knochernen Labyrinths. [On the Origin of the Cartilaginous and Osseous Labyrinth]. *Ber. d. Münchener Naturf. Vers.*, 1877, p. 343.

3. L. Löwe : Ueber die Anfänge der Ohrmuschelbildung by einem menschlichen Embryo von 1 *cm.* Körperlänge. [On the Rudiments of Pinna-formation in a human Embryo of the Length of One Centimetre]. Archives of Otology, 1878, p. 196.

4. Kuhn : Untersuchungen über das häutige Labyrinth der Knochenfische. [Investigations on the Membranous Labyrinth of the Osseous Fishes]. *Arch. f. Mikr. Anat.*, Bd. XIV., 3, pp. 264–307. 4 Plates.

5. J. Gruber : Beitrag zur Entwickelungsgeschichte des Steigbügels und des ovalen Fensters. [Contribution to the History of the Development of the Stapes and the Fenestra Ovalis]. Schenck's Embryol. Mitth., Vienna, 1878, p. 167.

6. C. Reschreiter : Zur Morphologie des Sinus Maxillaris. Stuttgart. [On the Shape of the Maxillary Sinus]. Cotta, 1878, pp. 44, 2 plates.

8. Moldenhauer : Vergleichende Histologie des Trommelfelles. [Comparative Histology of the Membrana Tympani]. *Archive of Otology*, 1878, 1.

8. D. Hunt : A Comparative Sketch of The Early Development of the Ear and Eye in the Pig, together with a new Account of the Development of the Meatus Externus, Drum, and Eustachian Tube. Transact. of the International Otological Congress. Comp. *Amer. Jour. of the Med. Sciences* for January.

9. V. Urbanschitsch : Das Lumen des äuseren Gehöranges bei Embryonen und Neugeborenen. [The Calibre of the External Auditory Meatus in Embryos and the Newborn]. Schenk's Embryol. Mitth. Vienna, 1878, p. 431.

1. From the book of the brothers Hertwig (1) treating of the whole nervous system of the medusæ, the Reviewer selects only those paragraphs having reference to the organ of hearing. As is

well known, medusæ are divided into two classes: Craspedota and Acraspeda, according to the presence of a muscular margin—the so-called velum—around the disc (hence Craspedota), or its absence (Acraspeda). In the first place, as regards the medusæ craspedotæ, those in the possession of an organ of hearing lack the organ of sight, and vice versa; so that these two perceptive organs seem to exclude one another. The brothers Hertwig first discuss that form of auditory organ found in the vesicularly margined medusæ or vesiculatæ (Mitrotocha, Tiaropsis). The simplest form of auditory organ in these animals consists of a series of open half-canals situated along the attached margin of the velum. Both epithelial layers of the velum take part in the formation of the canals. The epithelium of the upper side of the velum covers the thick convex surface of the half-canals, and in these places consists of large cells provided with a membrane and inclosing a quantity of fluid. The epithelium of the under side of the velum attaches to the concavity of the semi-tubes, and here mostly contains the concretions of lime. A row of cells along the inner margin of each channel assumes the form of a sensory epithelium, in which the cells on the one side, connect with the nervous ring by offshoots; on the other side, they develop auditory ciliæ. In the Mitrotocha, the brothers Hertwig have counted as many as eighty such auditory channels. In other vesiculates (Æquorea, Octorchis, Fucheilota, etc.), the open channels have transformed into closed sacculi. The latter stand in the same genetical relation to the former as the closed auditory vesicles of the full-grown vertebrates to the open half-canals of the vertebrate embryo.

In a second sub-genus of the craspedota, distinguished by their rigid gelatinous disc, and hence called Trachymedusæ, the organ of hearing appears in a totally different form and manner. Here it has the form of a modified tenacle, the simplest phase of which is a papilla, whose axis consists of a ridge of entoderm covered by an envelope of ectoderm. In the terminal cells of the entodermal axis there are some concretions of lime, and several cells of the ectodermal covering are metamorphosed into sensory cells provided with auditory ciliæ. In more complicated forms, the auditory papilla is inclosed in a cup-shaped circumvallation. Finally, in the most complicated formation of the geryonia, the cup is transformed into a closed vesicle.

In the acraspeda, too, the prevailing type of the auditory organ seems to be the modified tentacular form. The latter is most generally situated in an excavation of the lower surface of one of the segments of the disc, at its margin. The excavation may deepen into a canal. In the centre of the entodermal axis of the auditory tentacle is a prolongation of the gastro-vasicular canal-system ; the terminal knob of the entodermal axis contains concretions of lime. The ectodermal cells become cylindrical at the base of the auditory tentacle, acquire an auditory cilia, and connect with the nervous ring, whose ganglionic expansions they represent.

2. In rabbit embryos of a length from 7 to 8 *mm.*, according to Löwe (2), the first traces of a true cartilaginous tissue appear in the basis cranii. In earlier stages, the latter consist entirely of fœtal connective tissue. Two cartilaginous columns form first on each side, starting from the anterior margin of the chorda which extends only to the subsequent sella turcica. These parachordal cartilaginous shafts expand posteriorly and there form the anterior margin of the foramen occipitale. Anteriorly they consolidate in front of the chorda ; at their external margin the cartilaginous ear-capsules are situated. These, in the first stages, are in complete cartilaginous continuity of tissue with the parachordal cartilaginous columns. A large opening exists in the ear-capsules for the entrance of the acoustic nerve ; besides, there is a semicanal for the facial, and, thirdly, an aperture for the aquæductus. In immediate connection with the cartilaginous ear-capsule, the cartilaginous shaft for the first and for the second branchial arcs forms, so that the whole cartilaginous basis cranii at first is uninterrupted cartilaginous-tissue connection. But the later subdivisions into the isolated auditory ossicles, etc., are early marked by darker portions of tissue in the cartilage. The future organization then proceeds in this manner—while the entire cartilage ossifies, these darker portions of tissue remain unossified. Thus the cartilaginous basis cranii, originally cohering throughout and nearly homogeneous, breaks up into its component parts. The ear-capsule separates from the occipital vertebra, the stapes from the ear-capsule, the rest of the auditory ossicles from the stapes [comp. Gruber (5) and Hunt (8)].

3. In an embryo of a length of 1 *cm.*, according to Löwe (3), all essential parts of the pinna were already macroscopically unfolded, so that this structure appears earlier than the jointing of the foot, or the separation of the extremity into an upper and lower portion. The configuration of the pinna is pri-

marily traceable to the peculiar indentations ensuing in the entrance to the second branchial fissure, that is, the meatus auditorius externus.

4. Kuhn's researches were instituted on the auditory organ of the pike. In the first place, Kuhn confirms the existence of the two nerve-papillæ at the base of the utriculus, newly discovered by Retzius, so that now eight terminal nerve stations in the auditory organ of the osseous fishes are assured. Three of these are supplied, 1st, by the macula belonging to the recessus utriculi; 2nd, by the crista situated at the ampulla of the sagittal arch; and 3d, by the crista situated at the ampulla of the horizontal arch. The remaining five, however, namely, 4th, the macula sacculi; 5th, the crista lagenæ; 6th, the crista at the ampulla of the frontal arc; 7th and 8th, the two maculæ at the newly discovered papillæ partis basilaris, obtain their terminal nerve branches from the nervus cochleæ. The cristæ and the maculæ acusticæ are formed after the same type. The nerve-fibres, still surrounded by the marrow-sheath, pierce the cartilaginous supporting basis, upon which rests the auditory epithelium of the cristæ and maculæ. Immediately thereafter they lose their marrow-sheath and form an intra-epithelial nervous plexus between the auditory epithelial cells composed of three different elements. The lowest layer of the latter consists of round elements; then follows a layer of filamentous cells; upon these is a layer of ciliated cylindrical cells. The filamentous cells have a large nucleus and two processes: the upper either goes upward between the cylindrical cells, terminating free, or it approaches the basal process of a cylindrical cell; the lower process advances into a delicate nerve-fibre coming from the intra-epithelial plexus. The filamentous cells, then, are nervous terminal apparatuses, inclosed in the course of a nerve-fibre; the extruding fibre ends either free or at a cylindrical cell. In the latter case, the cylindrical cells are also in connection with nerve-fibres. Hence it still remains doubtful whether the vibrating-citræ upon the terminal surface of the cylindrical cells are the last links of a nerve-ending. The entire auditory epithelium is covered by a homogenous membrane remaining comparatively thin and flatly expanded upon the maculæ, but upon the cristæ swelling to a conical or fungi-form *cupula terminalis tectoria.*

According to Gruber (5), the stapes does not originate, as Reichert maintains, in the cartilaginous visceral stripe of the second visceral arc, but in the calvarian vertebra, that is, in the same formative tissue from which the capsule of the labyrinth is developed. The author never found the plate of the stapes sufficiently separated from the wall of the labyrinth to justify the assumption that the union of the two occurs by the completed plate of the stapes entering into connection with the margin of the fenestra ovalis. The author's illustrations show that in no stage of development of the embryo is the finestra ovalis preformed for the reception of the plate of the stapes, but that it must be understood, as it were, as a state consequent on the separation of the plate of the stapes from the wall of the labyrinth. [Gruber's communications fully agree with the statements of the Reviewer (2) and of Hunt (8)].

Reschreiter (6), a pupil of Rüdinger, has investigated the growth of the superior maxillary bone and the origin of the sinus maxillaris. The first outline of the sinus maxillaris shows itself in the lateral nasal cartilage; in the third or fourth month we observe a furrow in the bone caused by the elevation of a lateral and interior wall; the demarcation is already distinct, but interiorly it becomes so only in the sixth or seventh month. Both limiting walls close anteriorly in the seventh to eighth month; the interior wall gradually attaches itself posteriorly close to the bone; the exterior wall curves inward and becomes the superior, then posteriorly downward and thus becomes the posterior; the angle between posterior and inferior with the adjoining parts of both, is the last to be developed. In consequence of these conditions and by lateral growth, the sulcus becomes an elongated oval sinus, the largest diameter being antero-posteriorly, the smallest, from without inwards. The vertical diameter of the sinus can increase only with the elevation of the floor of the orbita above the alveoli; below the infra-orbital canal the cavity cannot yet expand outwardly, hence the vertical and horizontal diameters progress apace. The growth of the body of the maxillary bone, and with it of the sinus maxillaris, is dependent, preeminently, upon the appearance, course, and termination of the second dentition. For the sinus does not expand correspondingly as the maxillary bone lengthens or widens, directly following its growth; but according as the teeth descend sooner or later into the alveoli, so that the spongy osseous tissue may then be re-absorbed. Ordinarily, the incisors first emerge, then the cuspids next the anterior molar, then the posterior molars, and the size of the maxillary cavity increases accordingly. Hence, the absolutely and relatively small vertical diameter, until the last molar has emerged. The antero-posterior diameter also increases thereby, because the maxillary bone is pushed forward by the tooth inserting itself between its predecessor and the adjoining bone, thus affording the sinus room to expand in this direction too. The size of the entrance grows particularly in the diameter from above downward, less in the one from behind forward. The sinus maxillaris has reached its complete development after the breaking through of the wisdom tooth. The sinus maxillaris of the man is distinguished from that of the woman by its regular form, by the size and shape of its anterior surface, but especially by its projecting downward above the level of the nasal cavity.

Moldenhauer (7) gives a review of the structure of the membrana tympani of amphibia, reptiles and birds. Of amphibia and reptiles, bactrachians, tortoises and lizards were examined ; of birds, hens, geese and ducks. The drum of frogs consists of a membrana propria, covered externally by the epidermis, internally by the mucous membrane. The external skin continues in all terminal layers to the membrana tympani, and is even provided with dermal glands and numerous pigment cells. The membrana propria, springing from the cartilaginous wall of the drum cavity, consists in its marginal portion of a radially disposed organic muscle ; beyond, of filamentous radiating fibres which are found particularly distinct near the centre. The epithelium of the tympanic cavity is a cylindrical ciliated epithelium, which changes to a polygonal pavement epithelium within the confines of the membrana tympani. The membrana tympani of tortoises is similarly arranged as that of frogs as respect the memous layer, except that the glands are absent. A disciform expansion of the columella takes the place of the membrana propria. This cartilaginous disc is fastened by a circular band to the margin of the tympanic cavity, and interiorly is covered by teeth-like extensions of connective tissue, as well as a polygonal pavement epithelium. The membrana tympani of lizards is extremely delicate, but three layers may also be distinguished : 1st, the pigmental dermal layer ; 2nd, a thin filamentous layer of radial fibres ; and 3d, the polygonal epithelial layer. Near the membrana tympani the columella divides into several cartilaginous branches, one of which extends from behind and above to the centre of the membrana tympani, causing a slight convexity outward. The membrana tympani of birds is likewise very delicate, and in it, too, three layers may be recognized. The membrana propria consists of a radial layer and fibrous extensions terminating in the direction of the tendons. Near the membrana tympani the osseous columella becomes cartilaginous and divides into three branches, the longest of which bends almost at a right angle, and terminates toward the centre. The sound waves striking the membrana tympani act on a bent lever, the hypomochlion of which is situated at the rim of the membrana tympani, and by which one margin of the columella disc is pressed more deeply into the vestibule than the other. A rotation occurs coincident therewith. Different from the human membrana tympani, that of birds is strongly curved outward.

8. According to Hunt (8) the first maxillary fissure does not remain open, but closes again with the exception of a slight depression. From here the meatus externus forms by alterations of growth and the deepening of the cavity ; while the tube originates in a new depression from the direction of the pharyngeal mucous membrane. The canal of the tube grows toward the meatus, so as to assume a position below the latter. Between the two canals a membranous mass of tissue, the membrana tympani, remains. The stapes forms in connection with the wall of the vestibulum [See Gruber (5) and Reviewer (2)].

In many animals, according to Urbantschitsch (9), the external ear at the origin of the pinna closes completely for a time. The pinna takes part in the closure of the auditory opening in various ways, namely, either the pinna occluding the auditory orifice remains in this position for several days after birth (mouse), or it detaches itself from the auditory orifice (while still in embryonal development (rabbit). The manner of closure of the auditory orifice by the concha differs besides in various animals in this respect, that either the margins of the inverted upper half of the auricle simply join to the margins of the lower half (*e. g.*, mouse, hare, cow, cat), or else the margins of the lower section of the auricle, rolled inward, run into each other (rabbit, pig). In the new born human being, there is no epithelial adhesion present, but a complete apposition of the walls of the auditory meatus takes place. As regards the further development of the calibre of the external auditory meatus of man, it seems that an air-inclosing space forms first at the entrance to the auditory canal, and at its inner end at the membrana tympani. At least the author observed, in longitudinal sections through the external meatus of children several weeks old, that the external meatus consists of two funnels expanding externally and internally, the narrow portions meeting at the junction of the cartilaginous and the membranous parts of the auditory meatus, at which place the walls are still in direct mutual contact. It is only during further growth, with simultaneous greater development of the canals, that the walls at this place also separate throughout from each other, and an isthmus is seen which is found less pronounced in the succeeding years of life, and which, as is well known, exhibits individual variations in the adult.

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ARCHIVES OF OTOLOGY.

CONTRIBUTIONS TO THE PATHOLOGY AND PATHOLOGICAL ANATOMY OF THE ORGAN OF HEARING.

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(*Continued from page* 480 *of Vol. vii, of Arch. of Ophthalmology and Otology*).

B.

THREE CASES OF SECONDARY AFFECTION OF THE TEMPORAL BONE IN CONSEQUENCE OF NEO-PLASMA IN THE POSTERIOR NARES, WITH REMARKS ON SYMPTOMATOLOGY AND TREATMENT.

The first of the following cases was observed in Friedreich's clinic, the third in Simon's clinic. For the clinical histories I am indebted to the clinical's assistants, Drs. Eisenlohr and Schädel. The third case was seen in common by my colleagues Dr. Erb, Dr. Fischer of Mannheim and myself.

Case I.—Joseph Zartmann, 19 years of age, a joiner from Neckarsulm, was brought to the Medical clinic at Heidelberg on December 14, 1873. He stated that since the latter part of November of that year he has had a lancinating pain in the right ear and in the region of the right mastoid, which was accompanied by noises in the ears, and increased in intensity as time went on. On December 7th, a paracentesis was performed on the right *M. T.*, and a small quantity of pus let out. The pain abated; afterward pain, unaccompanied by tinnitus, attacked the left ear.

In the first days of his stay in the hospital, (the treatment was conducted by Prof. Moos), there was an alternate increase and diminution of the pain in both ears and the head. About the last of December a swelling was observed in region of the right sterno-cleido-mastoideus muscle, which extended from the mastoid process to about 1″ below it, to which was added a pharyngitis that caused the patient a good deal of difficulty in swallowing.

On January 1st, a hard tumor, the size of a hazel-nut was noticed behind the angle of the jaw on the right side. Tinnitus and pain continued, especially in the right ear, and were often so severe that morphium had to be given in large doses.

During the first fourteen days of January, the earache again gave way ; on the 14th it was noted that *the right half of the palate was not so movable as the left, and that the uvula hung towards the left side.* The pain now extended more over the whole right side of the head and face ; frequent epistaxis, (shortly after the commencement of the pharyngitis there occurred a hemorrhage from the mucous membrane of the throat, which came from an erosion of the parts). Opening of the mouth gives pain. The pain in the right ear became again more violent during January.

The teeth on the right side began in time to pain him. The paralysis of the right half of the palate increased.

Since January 26th Politzer's method was used : on January 25th, an examination showed the *M. T. without* perforation.

The left side of the head is not perfectly free, pain sometimes in the left ear, and sometimes on the left side of the head. The patient begins to lose flesh rapidly ; the appetite is poor.

An examination of the function of hearing on February 12th showed that on the *right* side the watch is not heard when held immediately before the external meatus, nor when applied to the cranial bones. The watch is heard on the *left* side, even when removed at some distance. An electrical examination shows simply a hyperæsthesia of the acoustic nerve.

Epistaxis more frequent ; pain in both ears ; the local treatment (catheterization and Politzer) was discontinued.

New symptoms were noted on February 19th : the neck was stiff ; the sterno-cleido-mast. muscle contracted, lateral movements of the head painful ; the tumor before noted in the right sterno-cleido-mast. region below the mast. process has enlarged (swollen lymph gland) ; other smaller tumors are found near it ; the right palate is completely paralysed. Behind the left sterno-cleido-mast. a collection of smaller and sensitive glands.

On account of an exacerbation of pain in right side of the head, ear and teeth, three leeches were applied on the right mastoid region, but with no effect; large doses of morphium were also of no avail; after the application of the leeches the *tinnitus in the right ear was louder and continuous.* The use of the galvanic current had no curative effect on the tinnitus.

At the beginning of March a *tumor* could be seen and felt, which pushed the right half of the soft palate strongly forward, and obstructed the passage through the right nostril. It had taken possession of the niche between the two palatine arches on the right side, and could be followed downward to the level of the epiglottis.

Swallowing became more difficult, as did also speech, which is nasal in character. Great pain in the region supplied by the trigeminus; blepharospasm; later, ptosis on right side, and slight weakening of the right facial.

Hearing power on right side = null; on left side tolerably good. From 3 to 4 times daily morphia injections of 0.015 to 0.02.

On March 12th, œdema of the right side of the face; the tumor has almost completely filled the throat, and has extended itself over towards the left; an increase in the number of swollen lymph-glands on both sides of the neck, which occasion great pain.

On March 16th, pain by pressure on the upper cervical vertebræ, the mouth can only be opened to a limited extent; the nasal passages almost obstructed. *No* marked facial paralysis; an anæsthetic spot in the lower orbital region on the right side.

The tinnitus on the right side continues. The general condition of the patient is becoming worse daily; the distracting pain, frequent hemorrhages from various parts of the tumor, the obstruction to swallowing, all conspire to an increasing emaciation and debility.

On April 10th a shortness of breath set in; expectoration of the bronchial secretion was impossible; the lower posterior portion of the lungs gave a dull sound on percussion. Under increasing cyanosis, gradual loss of consciousness, and slowing respirations, he died on April 11th, at 11 o'clock.

Clinical diagnosis: Sarcoma basis cranii; otitis media.

Extract from the record of the Ear-clinic: J. Z., joiner, presented himself for the first time on December 2, 1873. His ear trouble, for which he could assign no cause, had existed, according to his statement, for four weeks. Since that time he has had an almost continuous headache on the right side, and a lancinating pain in the right ear, with no apparent discharge, together with constant tinnitus and considerable diminution of his usual hearing-power on this side. An examination showed the lower wall of the external meatus to be covered with pus and epithelium. The vessels along the handle of the malleus are hyperæmic, the *M. T.* itself is infiltrated with serum, and has a perforation behind the middle of the malleus-handle the size of a pin-head.

Hearing distance for speech 1 *m.*, for the watch 2 *cm.* Bone conduction lacking for the watch and tuning-fork. No alteration has ever been noticeable in the left ear. The inflammation of the tympanic cavity was treated with instillation of zinc. sulp. 0.2 ad 30.0. In two days the perforation had healed. The subjective sensations and the deep aural pain, however, became more intense. The absence of bone conduction for watch and tuning-fork remained. After the healing of the perforation an effort was made to give the patient relief by means of the air-douche, but neither the catheter nor Politzer's method had any effect.

At no time did the driving of air into the tympanic cavity cause a diminution of the subjective noises, or an increase of the hearing power. On December 7th, there was seen on the lower portion of the very *concave M. T.*, without anywhere any partial protuberance, a yellowish-green discoloration, similar to a hypopyon behind the cornea, on account of which a paracentesis was made. There was no discharge of pus following this, not even after the air-bath ; it only came out after a rarefication of the air in the external meatus. After the discharge of a moderate quantity of pus, the pain abated, but the tinnitus continued. The watch was heard at 6 *cm.*, and whispers close to the ear. After the healing of the paracentesis the pain rapidly returned, but no renewed formation of pus in the tympanic cavity was demonstrated. The treatment instituted after the paracentesis had no effect. Catheterization was painful ; each unsuccessful attempt to turn the instrument was followed by a slight hemorrhage, and since the persistant absence of bone conduction for the watch and tuning-fork made the presence of a labyrinth affection certain, and as all treatment of the middle ear seemed to be fruitless, he was transferred in the middle of February to the medical clinic.

Sectio cadaveris: made on April 13th, by Prof. Arnold. Extract from the record:—

Anatomical diagnosis: Retropharyngeal cancer with metastasis in the neighboring lymph-glands, bronchitis, bronchi-ectasia, purulent peri-bronchitis, and broncho-pneumonia, lobular catarrhal pneumonia, dry fibrous pleuritis, alveolar spindle-celled sarcoma.

The relations of the tumor to the neighboring parts were as follows:

After opening the skull the *clivus* of the sphenoid and occipital bones was found to be pushed somewhat forward and soft to the touch. Brain and membranes normal. The lymph-glands on the right side of the throat slightly swollen. On opening the throat there was found on the right side a tumor the size of a plum extending into the base of the skull. The surface of the tumor is smooth, soft and of grayish-red color. The tumor extends in the broken down tissue of the sphenoid and occipital bones backward on the left side as far as the apex of the petrous bone, and forward as far as the sphenoidal cavity. It has completely destroyed the pyramid of the right petrous bone and extends thence to the posterior wall of the superior maxillary bone; outward it reaches to the ascending ramus of the lower maxilla. On the left side of the neck on the large *vessels* a number of very much swollen, soft-looking lymph-glands. On the right side the tumor surrounds the vagus nerve and the sympathetic at the base of the skull. It is in all its parts of an even grayish-red appearance, and soft in consistency. The dura mater is not perforated anywhere. The mucous membrane of the throat is much swollen and congested.

The temperal bone was put in Müller's fluid and then treated with alcohol. The examination was made by me on 22d June, and revealed the following: The tumor had not only destroyed the apex of the petrous bone, but had also completely dislodged the osseous frame-work on one side to a distance of 7 *mm.* from the eminentia arcuata, and on the other side to that part of the roof of the tympanic cavity opposite to the last. After the removal of the somewhat thickened dura mater, which on its inner surface was attached to the surface of the mass, the flat tumor was exposed to view to the breadth of about 2 *cm.* *The greater part of the Eustachian tube is lost in the tumor-mass.* The osseous roof of the tympanic cavity is preserved up to a point opposite the tympanal orifice of the Eustachian tube, yet is easily removed with the labyrinth knife. The malleo-incudal articulation is imbedded in the hyperplastic mucous membrane and is immovable. The sagittal diameter of the preserved osseous roof of the drum, situate between the tympanic end of the tumor and the inner margin of the head of the malleus, is about 3 *mm.* This piece of bone is also easily removed. The musc. tens. tymp. is also lost in the tumor mass *i. e.*, destroyed by pressure from the tumor. The hammer rests against the wall of the labyrinth. The handle, when viewed from above, forms with its anterior edge the intratympanal limit of the new formation. When viewed from the external meatus, the *M. T.* appears funnel-shaped without perforation.

The limit of the new growth in the region of the porus acusticus internus corresponds to a line which passes from the angle of the petrous bone at the post. edge of the porus acusticus to the foramen jugulare. The dura mater surrounding the nervus acusticus and the facialis is on its anterior and inferior surfaces intimately united with the tumor, so that in stripping off this part of the dura, portions of the tumor remain adherent to it. The nerves themselves are somewhat flattened, but show an unaltered structure throughout their entire course in the petrous bone.

The microscopic examination of the membranous labyrinth showed no essential alteration aside from a strong vascularization and a great richness in margarine crystals, which disappeared by treatment with alcohol and turpentine. The stapes was in position and its foot-plate (laid bare from the vestibule) was not so easily movable as in the normal condition. A histological examination of the tumor showed the characteristics of an alveolar spindle-celled sarcoma.

Without any doubt, the development of the tumor took place from the right half of the basis cranii. The beginning of its development was in the highest degree obscure, and the complaints of the patient date back to the time when through the extension of the tumor to the right temporal bone, the function of hearing on that side began to be interfered with. It is difficult to judge, whether it was the middle or inner ear that was first affected. But the growth of the tumor upward makes it probable that the anatomical alterations began in both parts at the same time. It was only at the last that the growth of the tumor was in the direction of the porus acust. int., for otherwise, an examination of the two nerves lying in it would have revealed other alterations than mere flattening. At any rate, it came later than the hyperæmia of the labyrinth and the purulent inflammation of the tympanic mucous membrane. This cannot be considered as an *idiopathic*, but only as an irritative accompaniment, as a *symptom* called forth by a propagation of the irritated condition brought about by the encroachment of the tumor on the Eustachian tube. The constant impermeability of the tube, noticed from the first examination, is but too well demonstrated by the autopsy. The surgeon should, in cases of new growths in the naso pharyngeal space, pay special regard to this symptom, and a constant *impermeability* of the Eustachian tube when clearly demonstrated, is sufficient to stamp the case as a *noli me tangere*, as far as regards operative interference.

CASE II.—To a further elucidation of this question I offer another case, which, though I saw it only once in the ambulatorium, is yet calculated to substantiate the opinions already put forth.

Left-sided tic douloureux throughout the extent of the left trigeminus. Sarcomatous growth in the left naso pharyngeal space. Rapid growth upward and invasion of the cranial cavity. Left-sided exophthalmus with trigeminus ophthalmia. Permanent impermeability of the left tube. Death from exhaustion, in a condition of stupor.

Conrad Remmele, hitherto under the treatment of Dr. Emil Fischer in Mannheim, came to my clinic for the first time on May 25, 1875. The patient is 45 years old, and a railway-carriage porter. He has suffered since July, 1874, with an increasing impairment of hearing on the left side, without discharge, and at the commencement without pain. The latter set in in January, 1875, at the same time with a severe pain in the left half of the face. It has kept pace with this facial pain, which, in spite of all therapeutic measures still persists.

Status præsens: Left external meatus free, *M. T.* very concave, mucous surface hyperæmic. Lower anterior portion of the *M. T.*

of increased brightness. Short process prominent, handle drawn in. *The Eustachian tube impervious by both methods*, even after an incision into the *M. T.*, which healed rapidly. Catheterization not painful. Hearing distance for speech ½ *m.*, for the watch contact, bone-conduction for the watch and various tuning-forks present. Between the mastoid process and the lower maxilla on the left side, a tolerably large, elastic, smooth tumor, with a pale surface, and painful only when pushed toward the deeper portions of the neck. It has no connection with the left parotid. The opening of the mouth is restricted, but painless. The left palatine arch and the left tonsil are pushed toward the median line. An examination with the finger discovered as a cause for this a tumor in the left naso pharyngeal space.

The examination which Dr. Erb was kind enough to make at my request, showed a considerably diminished sensibility of the left side of the face, corresponding to the second and third branches of the trigeminus. The sensibility and taste on the left half of the tongue were almost completely abolished. The sensibility of the region supplied by the first branch of the fifth pair on the left side is normal. The function of the muscles of mastication does not seem to be impaired. From these symptoms Erb judged that there was a tumor in the spheno-palatine fossa.

I saw the patient again about the middle of June. The condition of the auditory apparatus remained as given above. I did not see him again, but heard from him through a letter from Dr. Fischer, dated November 10, 1876, as follows :

"Remmele's condition has grown worse. He is evidently much weaker. Since his last visit he has not been able to leave his bed. Vertigo, a peculiar alteration in his mental faculties, amounting almost to a psychosis : melancholia ; sleeplessness, in spite of large doses of chloral and morphia ; intense pain, which drove him almost to suicide. The external swelling increased. The parotid was affected ; the left eye was pushed forward, almost to the condition of exophthalmus, at first highly injected and swollen, and later haziness of the cornea, followed by desquamation and cicatrization, and finally atrophy with loss of vision. Hearing remained bad.

"As the patient was dangerous to himself and others, and as his relatives were exhausted in consequence of the long-continued close watching, it was deemed best to take him to the hospital, where he died in a condition of stupor and general exhaustion on March 6, 1876.

"The *autopsy* revealed a hard tumor the size of a small apple on the inner surface of the left anterior and middle cranial fossa, which on section was found to be a large whitish nodule, and under the microscope showed the characteristics of a sarcoma. The tumor was connected with the inner surface of the dura mater. The corresponding point on the anterior cerebral lobe was somewhat pressed in; the pia mater was injected in a punctiform manner. The cerebrum contained a moderate quantity of blood; the left eye was atrophic, the cornea opaque, partially flattened and cicatrized.

"In the region of the left parotid and lower maxillary region, a similar swelling was found, which extended upward into the left and middle cranial fossæ.

"Concerning alterations in the hearing apparatus, the records of the autopsy give no particulars."

CASE III. Nicholas Braunberg, 38 years old, a native of Wiesloch, was brought to the surgical clinic on April 23, 1872.

The hitherto healthy patient noticed the beginning of his present trouble at Christmas, 1877. The first thing observed was an ulcer in the region of the inner canthus of the left eye, which, however, discharged but little pus, but which, in spite of the employment of various remedial measures, refused to heal. He was at the same time unable to breathe through the nose, and it appeared to him as if both nostrils were stopped up. Somewhat later the palate was pushed forward into the oral cavity, and the whole pharyngeal space was filled by a tumor-mass.

Status præsens, April 23d: The strongly built, moderately emaciated patient, in whose internal organs no abnormality was detected, presented a remarkable flattening of the nostrils, with a simultaneous prominence of the osseous portions of the nose and the neighboring parts of the upper maxilla. In the region of the left nasal duct is an ulcer in the skin about the size of a dime. from which, on slight pressure, some pus escapes. Both nasal cavities are filled with a soft tumor-mass. This soft mass protrudes from a perforation in the left side of the nasal bone. Speech is indistinct and nasal. On opening the mouth, a soft protuberance, about the size of a half-dollar, covered with mucous membrane, is seen in the centre of the hard palate, at the periphery of which the osseous edge of the healthy portion is distinctly felt. The soft palate is pushed forward by the tumor-mass which fills the entire pharyngeal cavity. General condition as yet good.

Diagnosis : Sarcoma of the nasal and pharyngeal cavities, which has perforated the nasal bone.

April 30, 1872.—Osteo-plastic resection of the middle portions of the superior maxilla and nasal bone, the flaps of the skin and bone being turned back on the forehead.

An incision running from the lower edge of the orbit at the side of the nose downward to the corner of the mouth, cut through all the soft parts to the bone, to the right and left. With a panel-saw the connections on both sides of the middle portions of the upper maxilla with the region of the first grinder tooth were severed, the portion enclosing the processus alveolaris in front of the edge of the tumor on the hard palate was cut across with a bone-knife, and then both nasal bones were loosened with the bone scissors from their connection with the upper maxilla. In this way a flap was made which comprised the nose, the upper lip and, in connection with the middle portion, the processus alveolaris of the upper maxilla (4 incisor and 2 canine teeth), and both nasal bones. The flap was turned upward, the unbroken bony connection between the nasal bone on one side and the frontal bone on the other serving as a hinge. The sarcoma was now exposed. It filled the entire nasal cavity, had forced its way through into the antrum of Highmore, and posteriorly reached up to the base of the cranium.

The whole of the tumor mass was removed by knife, shears and sharp spoons. The hemorrhage was stopped with the actual cautery and the *osteo-cutaneous* flap was replaced and united with button-sutures. The bones were united by numerous sutures inserted in the gums. The deformity is almost null, aside from the defect in the hard-palate.

The reaction in the wound was very slight. The defect in the hard-palate was the greatest cause of inconvenience since it allowed, in drinking, a small portion of the liquid to pass out of the nose.

The flap healed by first intention ; the roots of the teeth are naturally loose.

June 4th.—Patient discharged. No return of tumor as yet.

June 28th.—Patient came back to the hospital with a return of he malady. The resected dental process is now tolerably firmly fixed ; it seems as if the ligamentous connection with the lateral parts had been restored. Patient had become hard of hearing. He went home for four weeks. On his return to us the impairment of hearing on both sides had increased so much that he could be made to understand *only by very loud screaming.* This condition remained unchanged until his death which took place October 4, 1872.

, *Sectio cadaveris :* Made on October 5, 1872, by Prof. Julius Arnold. Slight rigor mortis, skin white, great emaciation, muscles of a pale brown. Heart normal. In the lower lobe of the left lung a condition of great œdema and a strong hypostasis. A great deal of pus was found in the bronchi, and the mucous membrane was in a catarrhal condition.

Spleen, liver and kidneys show nothing special. The cranium behind the coronal suture somewhat pressed in and indented like a saddle. At the junction of the coronal and sagittal sutures two Wormian bones were found which had united at their circumference by means of a solid osseous connection with the neighboring parts. The interlacing parts of the sagittal and coronal sutures as well as the remaining portion of the frontal suture were synostotic.

On the dura mater nothing special was noted ; the pia mater on the convexity is also normal, but on the base of the cranium the dura mater corresponding to the anterior cranial fossa—especially the lamina vitrosa at the right middle cranial fossa and the sella turcica—is studded with soft, pulpy very vascular nodules. At these points the pia mater is adherent. The substance of the right cerebral lobe is hyperæmic and studded with small red spots, otherwise of a diffuse yellow color. The lamina cribrosa, the right orbital roof, the apex of the right temporal bone, the body of the sphenoid bone are all infiltrated with the pulpy mass, and more or less completely transformed into it. The region of the nose and upper maxilla very prominent and swollen. The right eyeball pushed forward ; in two places the skin of the tumor is perforated. A tumor mass was found on the roof of the oral cavity which was infiltrated with offensive fluid. The alveolar process of the maxilla were likewise involved in the tumor-mass, to which the teeth were loosely adherent. The pharyngeal vault as well as the nasal cavity was likewise filled with the mass.

Anatomical diagnosis : Retro-pharynyeal sarcoma, perforation of the cranial cavity, oral cavity, nasal and maxillary fossæ. Unfortunately I was allowed only an incomplete examination of the petrous bone, since a separation of this bone from the remainder of the cranium would have destroyed its value for the illustration of other points for which it was designed. What I did find was the following: The two nasal cavities were completely filled with the tumor, so that it would not have been possible to have introduced a metallic catheter of even the smallest dimensions, and so much the less, because the tumor had destroyed the greater part of the bony floor of the nasal cavity.

The examination of the pharynx in a vertical section of the cranium showed that the tumor sprang from the entire base of the cranium, the right half was intimately united with the walls of the right phanyngeal space, also in the region of *Rosenmüllers fossa* on the right side and with the *right* ostium. pharyn. tub. Eust On the left side, on the other hand, which was likewise filled with the tumor-mass, there was no adhesion between the tumor and the anterior and posterior walls. Here there was a tumor springing likewise from the base of the cranium which was movable, and on the upper third there was a cleft going from behind forward through the tumor, but which did not completely divide it, giving one the idea that there were two tumors, the upper one being the smaller. By pushing the tumor aside, the space of Rosenmüllers fossa was found to be flattened out, as was also the tubal nipple. The opening of the pharyngeal end of the tube was round, the size of a pea, the wall moderately thick, and the edge of the orifice perfectly flat. A catheter 2 *mm.* in diameter was passed into the tube about 2 *cm.*, but it was not possible to force air into the tympanic cavity.

Both external canals were free. The *M. TT.* were not altered as to color, but sunken, and lay against the central part of the promontory. The short process was very prominent. So far as an external examination of the middle cranial fossa warranted an opinion, the remaining portions of the organ of hearing were intact. The tumor which had grown in the region of the apex of the right petrous bone in the middle cranial fossa, was 2½ *cm.* in its greatest breadth, and 3 *cm.* in its greatest length. On its anterior surface it was concave, on its posterior surface convex. Its posterior extremity was directed toward the labyrinth. Yet there was an unfilled space of about 2 *cm.* between the posterior edge of the tumor mass and the eminentia arcuata, so that an affection of the labyrinth could hardly have come from a growth of the tumor from this direction (or from below either).

To the outer side of the one just described there lay a second tumor somewhat larger in its diameter, whose posterior limit fell about 1 *cm.* short of the other, leaving the osseous covering of the middle ear intact.

The tumor on the apex of the left petrous bone, on account of its small size—it was about the size of a hazlenut—was considered of no consequence in its relation to the other parts of the petrous bone, which, to all outward appearances, were intact.

In endeavoring in this case to deduce from the symptoms of the new formation in the pharynx presented during life and the appearances found after death, some important facts as regards the symptomatology and treatment of future analogous cases—disease of the temporal bone as a complication of new formations in the pharynx—we will find, apart from the examination with the Rhinoscope and the finger, and the difficulties in respiration and deglutition, the following of more or less weight:

1. The constant impermeability of the Eustachian tube, by all methods, a certain proof that the new formation has already affected the tube, or that the tube has already been absorbed in the tumor-mass.
2. In consequence of the impermeability of the tube, an excessive sinking of the *M. T.*
3. A more or less considerable purulent inflammation of the mucous membrane of the tympanic cavity, as a symptom of the invasion of the region of the middle ear by the new formation.
4. Aside from the other symptoms of purulent otitis media, and aside from the pain consequent upon this, a persistent headache in consequence of pressure exerted by the enlarging new-growth.
5. Continuous severe subjective noises, due, either to increase of intra-auricular pressure or hyperæmia of the labyrinth, as symptoms of the involvment of this region in the tumor, or to both.*

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* A complete cessation of the subjective noises in spite of the progress of the tumor was possible in this case, owing to the fact that the whole labyrinth was involved in the tumor-mass. The large pearl-tumors in the temporal bones seem to favor this opinion.

6. Abolition of bone conduction for all kinds of tones.

7. The high degree of deafness, or complete abolition of hearing power.

8. The swelling of the cervical glands as a special indication of the malignancy of the new-growth.

So long as the labyrinth and tympanic cavity are intact, and the impairment of hearing is due alone to the impermeability of the tube, a palliative means for the improvement of hearing is to be found in paracentesis of the *M. T.*, care being taken to keep the artificial opening patent. So soon as the involvement of the tube in the tumor is demonstrated, furthur operative procedures are of doubtful utility.

C.

ORGANIC ALTERATION IN THE ORGAN OF HEARING IN A CASE OF AUDITORY HALLUCINATIONS WITH PSYCHIC DERANGEMENT.

Chronic catarrh of the pharynx and the whole middle ear on both sides. Chronic ostitis of the cranium and the temporal bone. Chronic periostitis of the tympanic cavity, with partial anchylosis of the ossicles, especially on the right side. Shortening of the tensor tympani on the left side. Senile alterations in the cellular structure of the labyrinth. A high degree of deafness, greater on the right side than on the left. Psychic derangement with hallucination of hearing coming from the left side.

Justine Lender was in her 70th year transferred from the Frankfort Almshouse to the City Insane Asylum, where she died in her 75th year. She emigrated from Würtemberg, and was in service in Frankfort until her 36th year, at which time she married. Her husband squandered her hard-earned property and mistreated her so that she obtained a divorce and again entered service, where on account of senile marasmus and arthritis, she remained until she was brought to the almshouse, where the mental derangement was developed. Already in her last service she heard in her room a noise of blows or as if something were moving about, which she finally became convinced was the ghost of her husband who was now dead. His persecution of her increased with time; he rejoiced in being able to torment her and left her no peace either day or night. He howls into her ears, he beats his fists, makes a noise like a sewing machine and hammers, roars and grinds his teeth like a lion, and pretends he is going to swallow her like a tiger, &c. During her stay in the institute she sometimes stopped her ears on account of the noises, especially the right, (and demanded that the tormentor be driven out of it) and was often very restless and noisy on account of her hallucination.

The character of her delusions of hearing changed in the course of time; she heard, for example, the cries of children; they were the cries of her "own" child, though she had never had any children. She seems to hear some one torturing them, the children cry out for help, then they are murdered, etc. Sometimes the children sing beautiful songs. "Do you not hear how he howls, how he saws in the ear; Hoo, hoo, hoo, bum, bum, bum; like metal, or chains, etc."

On April 8, 1871, the following was noted in regard to the hearing power: "On the right side the patient has heard nothing for a long time. A loud ticking watch was not heard either before the meatus, nor on the mastoid process, nor on the vertex. The left ear has also gradually become hard of hearing. It is necessary to speak very loud to her. All hullucinations seem to reside in the left ear." The record does not give an account of any further examination of the hearing apparatus.

During the latter part of her life a sarcoma ventriculi was developed. She suffered from almost constant vomiting until her death which took place on January 14th.

The *sectio cadaveris* was made fourteen hours after death by Dr. Lotz. The record shows:

The cranial bones bloodless, white and thick. Diploë absent. Inner table thickened, not united to the dura mater. Sutures preserved.

Atrophia cerebri, hydro-cephalus externus. Striæ acusticæ very indistinct. Atheroma of the arteries at the base of the cranium. Senile thickening of the apex of the right lung. Hyperæmia and œdema of the remaining portions of the lungs. Pseudomembranes on pleura. Heart fatty. Stenosis of the *bicuspids.* Atheroma of the aorta, carcinoma ventriculi.

Examination of both petrous bones. The bony substance. sclerosed. Both meatus normal. *Right M.T.* very concave in the prolongation of the axis of the handle ; in the lower posterior quadrant two small atrophic spots. Light spot somewhat indistinct. Mucous membrane of the *M.T.* opaque, the tympanic cavity itself much thickened, especially on the promontory. The malleo-incudal and stapedo-incudal articulations stiff. The plate of the stapes not at all movable. Walls of the tympanic cavity hyperostotic, and in consequence of these alterations the round window whose diameter amounts to only ½ *mm.* is almost inaccessible. *Left M. T.* funnel-shaped, thickened in all its layers, with only the short process, which, together with the partition fold of the *M. T.* is very prominent, visible. The handle not visible on account of an excessive shortening of the otherwise very thin tensor tympani ; the handle passes transversely over the inner surface of the opaque *M. T.*, its top looking toward the tympanal orifice of the tube.

The ossicles in their articulations are stiff, but movement is at no place entirely absent. The diameter of the round window amounts to about 1 *mm.* In consequence of the hypertrophy on the promontory, this also is difficult to get at. (The measurements were taken from both sides of the labyrinth.) The microscopic examination of both tensores tympanorum showed a normal condition of the muscular substance, on the left side a slight increase of the intermuscular connective tissue. The posterior wall of the pharynx and the mucous membrane on the basis cranii were covered with thick yellow scabs. Rosenmüller's fossa on the right side much shallower than on the left. In the ostium pharyngeum of both tubes there was a moderate quantity of glairy mucus. Both tubes impermeable for small sounds and air bath. The examination of a cross section showed on both sides : 1, a disappearance of the folds and prominences on the floor and lateral walls ; 2, Hypertrophy of the submucous tissue, and 3, of the tendinous fibres of the tensor veli palati.

Right labyrinth : The membranous semi-circular canals very atrophic, particularly when compared with the left side. On both sides, the epithelium on the membranous semi-circular canals as well as in the vestibular structures, and also the cellular tissues of the lamina spiralis membrana, showed a great richness in fatty globules (evidently senile changes) ; the substance of the pillars of Cortis arches had preserved its normal homogeneous appearance.

The condition of both petrous bones offered as a whole nothing remarkable. It represented the terminal condition of a slow inflammation in the middle ear, which in this case originally began in the mucous membrane of the pharynx, and finally led to closure of the tube, sclerosis of the mucous membrane and anchylosis of the ossicles.

From a physiological point of view it is remarkable that the hallucinations of hearing proceeded from the left side. Is this due to the fact that the function of the left ear was less impaired than that of the right, or was it that the subjective noises, on account of the great shortening of the tensor tympani, and the attendant diminished movability of the ossicles, were more intense on the left side than on the right, and as a consequence the delusions of hearing had their origin there? This question is difficult to answer, because auditory-hallucination can arise from objective sounds as well as subjective. If a division of the tendon of the tensor tympani can bring about a permanent relief to the subjective sensations of sound, which, it is true, yet remains to be proven, then the answer to this question in the affirmative has a no inconsiderable importance for practical psychiatrics, particularly as regards the therapeutic management of cases like the foregoing, where the psychosis was initiated by hallucinations of hearing.

D.

TRAUMATIC DISLOCATION OF THE MALLEUS AND INCUS, WITH MEMBRANA TYMPANI INTACT.

Fall on the head, probably the right side; fissure of the right frontal bone; diastasis of the right coronal and squamous sutures; hemorrhage between the dura and the cranial bones on the right side; laceration of the meningeal artery; hemorrhage in the pons cerebri; dislocation of the hammer and anvil.

M., 19 years of age, merchant, fell on February 1, 1873, in a place of amusement down the cellar stairs. Immediately after the accident he felt no particular inconvenience, drank a glass of beer with his comrades, and went alone to his home—a walk of about ten minutes. The next morning he was found unconcious. He died on February 2d. *Sectio cadaveris* on February 3d by Prof. Julius Arnold. Rigor mortis well marked, strong bony structure, skin white, abundant subcutaneous connective tissue, dark red muscular tissue. In the right temporal region the skin somewhat shrivelled, very prominent; suggillation. In the same region an extensive hemorrhagic infiltration of the connective tissue and the scalp.

The coronal suture on the right gaped to a considerable degree. In its upper division there was a fine fissure extending two inches into the frontal bone, which forked at its termination. At the junction of the coronal and squamous sutures a fissure runs through the anterior inferior division of the frontal bone directly downward, and, after running a short distance, again passes into the suture between the sphenoid bone and the squamous portion of the temporal bone. The suture between the squamous and petrous portions of the temporal bone is ruptured, and there is blood in the interspace. The coronal suture likewise shows on the left side a slight diastasis.

The dura mater is loosened, and the cavity caused thereby—of about the size of the fist—in the middle cranial fossa, is filled with coagulated blood. This blood seems to have come from a wounding of the arteria meningea media close to the foramen rotundum. The right temporal lobe of the brain is compressed. In the corpora quadrigemina and pons are numerous punctiform hemorrhages. Brain otherwise normal.

Anatomical diagnosis: Hemorrhage between the dura and skull; fissure in the right frontal bone; diastasis of the coronal and squamous sutures; rupture of the arteria meningea media. Hemorrhage into the pons cerebri.

*Right petrous bone:** External meatus normal. *M. T.* intact, the periphery and the division above the short process slightly hyperæmic, otherwise normal. The bony covering of the antrum mastoideum, and the cells of the mastoid process itself, suffer from a bluish-black suggillation; in the cells themselves there was dark coagulated blood. In the tympanic cavity slight hyperæmia, especially at the periphery of the *M. T.* and the head of the hammer, the connection between the upper tympanic wall and the head of the hammer severed (rupture of the ligamentum mallei superius). If this is moved with a probe, the whole hammer hangs loose on the *M. T.*, but it is not entirely detached from it, the connection is only less close than normal. The stapes lies obliquely in the tympanic cavity, with its body against the neck of the hammer, with its tympanic process against the posterior wall of the tympanum, and its detached stapedial process against the niche of the oval window.

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* The preparation is in the collection of the Pathological Institute.

The macro- and microscopic examination of the labyrinth showed nothing abnormal. The sheath of the facialis was, from its second bending, abundantly infiltrated with blood.

What part the concussion of the temporal bone from the falling on the head played in the dislocation of the two first ossicles, and what the too strong traction and the loosening of the dura mater, is difficult to say, in the first place, because the malleo-incudal articulation lies near the fissura petro-squamosa, which was ruptured ; and secondly, because through this fissure numerous connective tissue bands pass into the tympanic apparatus.

E.

CONDITION AFTER A NATURAL HEALING OF A PURULENT INFLAMMATION OF BOTH TYMPANIC CAVITIES.

Tuberculosis pulmonum. Absence of symptoms of any ear disease during life, notwithstanding a condition of considerable alteration in the sound-conducting apparatus on both sides, as a result of an early purulent inflammation in the left ear.

Arthur Glass, twenty-six years old, was brought on May 11th, 1874, to the clinic of Prof. Friedreich. The patient is an instrument maker from Gosslar.

History: Five weeks before, a severe cough and diarrhœa ; previously only now and then some cough, without expectoration or hemoptysis. For five weeks, moderate fever, poor appetite, and great debility. Frequent night-sweats. There was no occasion to examine into the function of hearing since the patient's hearing was not impaired.

Status præsens: An examination revealed the existence of a *chronic*, probably *caseous*, pneumonia of both lungs; otherwise nothing worthy of mention. The further course of the disease did not notably differ from that of a rather rapid phthisis of the lungs. The diarrhœa soon diminished in severity, with only occasional exacerbations. About fourteen days before death a laryngitis made its appearance (finally complete aphonia). Death took place on September 19, 1874, five months and a half after the appearance of the pronounced phthisical symptoms.

The hearing power always seemed normal. At no time was there any trouble in the hearing apparatus sufficient to call for a careful examination during life. (The petrous bones had been removed from the cadaver for an entirely different purpose).

Sectio cadaveris: made by Prof. Arnold on Sept. 20th, 11 A. M.

Anatomical diagnosis: chronic ulcerated bronchitis, bronchiectasia, chronic caseous peri-bronchitis, and broncho-pneumonia. Cavities in the apices of the lungs, acute catarrhal pneumonia, miliary tubercles in the lungs, liver, mesenteric glands, tuberculous ulceration in the intestines, pharynx and larynx.

Examination of both petrous bones:

Right: External meatus contains much epithelium; the inner half, especially posteriorly and upward, red, *M. T.* funnel-shaped, a retraction of about the size of a pin's head above the short process, the layers on the posterior half thickened. Mucous membrane of the tympanic cavity hypertrophic, encasing the ossicles. Ossicles somewhat restricted in movement at their articulations. The roof of the tympanic cavity bluish-red, and rarefied; the same in the bony portion behind the eminentia arcuata, as far as the base of the petrous bone; in this region the dura mater is at points adherent, and there is a small opening with serrated edges (from former caries?).

Left: External meatus free. The *M. T.* presented before and behind the handle a large oval cicatrix; the rest is so thickened that no portion of the hammer is visible. The whole *M. T.* is drawn toward the promontory by means of a cicatrix. The hammer with its very much shortened handle (probably in consequence of a former necrosis) is drawn inward. The mucous membrane of the tympanic cavity somewhat thicker than normal. Articulations of the ossicles free. At the bony roof of the middle ear there was an adherence of the dura mater, and a small opening (carious?) in the bone. The labyrinth was not examined.

This is a remarkable example of natural healing of a purulent inflammation in both tympanic cavities, accompanied, most probably, by caries on the right side. Both ears were evidently not normal in their functions, but the disturbances were not marked enough to cause the patient to complain of impaired hearing, and the physician, Dr. Schultze, who treated him for a long time and watched him carefully, did not at any time observe defect in the function of hearing. It is possible that the original affection of the ear dated so far back that he had forgotten it. Such remarkable cases of natural healing offer much encouragement for a persistent treatment of those well-known rebellious cases of purulent otitis.

F.

ANCHYLOSIS OF THE STAPES ON BOTH SIDES WITH ONE-SIDED CLOSURE OF THE ROUND WINDOW.

Chronic purulent inflammation of both tympanic cavities of more than twenty years' standing. Total deafness on right side; loud voice heard on the left when spoken directly in the ear, up to the time of death. Anchylosis of the stapes on both sides. Closure of the fenestra rotunda on right; intact on left side.

Samuel Moser, aged 64. Before he came under my observation, on November 15, 1872, he was under treatment in Prof. Friedrich's clinic on account of diabetes mellitus.

According to the statement of the patient, the ear trouble dated twenty years back, yet may have existed longer, for the patient does not remember, notwithstanding the alterations to be mentioned, whether he had pain or a discharge from the ear; neither is he able to assign any cause for the trouble. On the other hand, he complains of intense tinnitus on both sides.

The external meatus on the right side is filled with thickened pus and epithelium. The handle portion of the *M. T.* and the parts immediately in front of and behind it are preserved; the shortened end of the handle is drawn against the promontory, the rest, as well as the mucous membrane of the labyrinth wall, which is visible, are thickened and red.

The external meatus on the left side is free; the *M. T.* is lacking in the greater part of its extent; in front and behind a small rim is left; the mucous membrane of the promontory red and much thickened. The hammer portion and the long shank of the incus not visible. On the right side there is total deafness for all tones, through the air as well as for bone conduction. On the left also there is lack of bone conduction, but by speaking loudly in the left ear, the record says, the patient can distinguish words, and the tuning forks *C′*, *C″*, are heard when vibrated in front of the external meatus. This minimum of hearing for speech and the discharge from the ear continued until his death, which took place on September 9, 1874, in consequence of œdema and gangrene of the lung.

Sectio cadaveris made on the following day by Prof. J. Arnold.

Anatomical diagnosis.—Gangrene of the upper lobe of the left lung; left-sided catarrhal pneumonia; œdema of both lungs, recent hyperæmia of the liver and kidneys; senile atrophy of the brain; dilatation of the art. basilaris; diabetes mellitus.

Examination af the petrous bones.—Both external meati contained a moderate quantity of greasy pus.

The *right M. T.* showed, aside from the alterations already mentioned, anteriorly and upward, a cicatricial condition, and a retraction in the direction of the ostium tympanicum tubæ, so that, in spite of the great defect in the membrane, a communication existed only with the posterior portion of the middle ear. In the centre of the cicatrix two depressions the size of a pin's head quite near each other, probably partial adhesions of the cicatrix. Malleo-incudal articulation was embedded in the excessive hypertrophy of the mucous membrane of the tympanic cavity, but movable. The same is true of the incudo-stapedial articulation. On laying bare the stapes-plate and the round window from within, the stapes was found to be anchylosed and the round window filled with a bony substance.*

Left M. T. is destroyed up to the periphery. Hammer and anvil are wanting, with the exception of the long process of the incus, which is fixed by a growth of connective tissue and displaced in a horizontal direction. On account of the great hypertrophy of the mucous membrane of the tympanic cavity, the communication with the mastoid cells is almost entirely cut off. The mucous membrane of the promontory shows, in addition to the general hypertrophy, some isolated connective tissue fibres. Two of these extend in an oblique direction, one above the other, like a bridge, toward the anterior periphery of the annulus, shutting the drum cavity off from the tympanic orifice of the tube. The stapes is anchylosed, the round window intact.

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* After the microscopic examination of the labyrinth, I ordinarily make an incision with a fine saw about one-half to one inch from the base of the stapes, which passes through the long axis of the petrous bone, and in a direction nearly parallel to the base of the stapes. In this manner we obtain very readily a view of both windows from within, and the preparation is saved for a demonstration of its tympanic portion.

In the labyrinth the periosteal covering in the right vestibule, as well as the connective tissue membrane of the vestibular structures, is thickened ; there is, moreover, an increased quantity of otoliths. Otherwise I found nowhere any marked anomaly.

With the *exception of its etiology*, the case resembles, both as regards the defect in hearing during life, and alterations found after death in the oval and round windows, one that was published by me some years ago.* Whilst in that case the alterations in both labyrinth windows represented a hyperostosis of the petrous bone accompanying a hyperostosis of the cranial bones, the cause in the case just related of the alterations in the labyrinth windows was a purulent inflammation of the mucous membrane of both tympanic cavities. But even here, notwithstanding the long continuance of the trouble, there was no appearance of secondary alteration in the labyrinth. The impairment of function during life and the changes found after death also demonstrate the functional importance of the round window, as did the other case.

G.

RESULT OF AN EXAMINATION OF A DEAF-MUTE.

Magdalena Stadler, 29 years old, from Ziegelhausen, was brought to the clinic of Prof. Friedreich on February 20, 1875.

Clinical diagnosis :—Pleuritis obsoleta lateris dext. ; Pneumonia chronic. lat. dext. Terminal disease—Meningitis tuberculosa. Furthermore, a congenital deaf-mute. During the last days ot life, May 18th, a marked left-sided facial paralysis. On May 17th, left-sided earache. Death on May 21st.

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* Archiv. f. Ohrenhielk. Bd. II, p. 190, et seq.

Anatomical diagnosis.—Obsolete pleuritis dext.; sacculated and partially caseous empyema; ulcerative cavities in the apex of the right lung; bronchiectasia, peribronchitis fibr. and caseosa of both lungs; miliary tubercles in both lungs, the pleura, liver, spleen, omentum, intestines and choroidea, meningitis tuberculosa basilaris, and of the brain; tubercular meningitis of the spinal cord; œdema cerebri.

Right petrous bone—Bony substance sclerosed; external meatus normal; *M. T.* flat and opaque; epidermis and the cuticular layer, except at the lower and anterior portion, so much thickened that only the short process is visible. The mucous membrane of the tympanic cavity, especially the part belonging to the *M. T.*, much hypertrophied; the approach to the round window is, through the hyperostosis of the floor of the drum, in a measure obstructed, the round window filled with bony substance; all the articulations are anchylosed; the structure of the musc. tensor tymp. *normal*. The tubes on both sides show a moderate cellular infiltration in their mucous membranes, the submucous tissue, the glands and the interacinose tissue.

Left petrous bone—External meatus red at its upper-inner end; *M. T.* funnel-shaped; short process prominent; handle somewhat shortened in perspective; mucous membrane of the tympanic cavity and *M. T.* thickened; malleo-incudal articulation and the connection between the anvil and the tympanic cavity but slightly movable. The incudo-stapedial and stapedo-vestibular articulations immovable; round window closed with bone; tensor tympani not shortened; structure of the muscle also *normal* on this side.

The examination of the labyrinth gave on both sides the same result; great quantity of otoliths and numerous colloid bodies in the ampullæ, the membranous saccules and the lamina spiralis membranacea.

Nothing worthy of mention was noted at the porus acusticus.

The results of the examination of the foregoing case show many points of analogy to the case of deaf-mutism which I described in these ARCHIVES, vol. iii, No. 2, p. 193, Sec. viii.

We have to do here probably, with the result of an early (probably congenital) periostitis of the petrous bones. The evidence of this is the sclerosis of the substance of these bones, the anchylosis of the ossicles, the partial hyperostotic condition of the bony walls of the tympanic cavity, and the closure of the round window. I look upon the small-celled infiltration found in the mucous membrane of the Eustachian tube as a symptom of an acute catarrh accompanying the miliary tuberculosis.

In this as well as in the other case of deaf-mutism described by me, the structure of the tensor tympani was normal. This normal condition, however, does not furnish a confirmation of the opinion of Magnus, (compare *Archiv f. Ohrenh'lk.*, Bd. xi, 3 and 4, p. 248), " that this muscle has no acoustic function, but is only a mechanical means of protection for the steadying and preservation of the hammer, that is of the ossicles, and *M. T.* against the violence which threatens them by sudden forcing of air through the tub. Eust. in sneezing, etc, (Virchow's *Archiv*, xx, p. 102, et seq.). Otherwise would the muscle, condemned to inactivity, undoubtedly become atrophic and undergo fatty degeneration." In opposition to this I desire to repeat some remarks made by me five years ago, (l. c.):

" From a physiological point of view it is of interest to note the normal microscopical condition of the tensores tympani. Although these have not exercised their function for hearing purposes during the life of the 64 years old deaf-mute, *yet there has been no fatty degeneration;* we find the reason for this in the anatomical connection between the musc. tens. veli palatini and tens. tymp., first pointed out by Ludwig Meyer, (Studies über die Anatomie des Canalis Eustachii, München, 1866), and verified by Kessel and others. The continual action of the tens. tymp. in the act of swallowing has prevented their fatty degeneration." It is probable that the presence of the colloid substance in the labyrinth (in the foregoing case), is in intimate connection with the congenital deaf-mutism, respectively with the abolition of the function of hearing.

H.

FOREIGN BODY IN THE EAR. DEATH FROM REPEATED VIOLENT EFFORTS AT EXTRACTION.

Penetration of a fragment of stone into the right external meatus. Repeated forcible attempts at extraction. Violent contractions in the region of the right facialis during the last attempt, followed soon by paralysis of the nerve. Traumatic perforation of the lower wall of the tympanic cavity, with repeated aural hemorrhages from the purulently inflamed vena jug. int. Injury of the canalis facialis. Septicæmia with metastatic deposits in the lungs and muscular tissues of the right lower extremities.

On June 20, 1876, Adam Schneider, a day laborer, from S——. in the Rhine Palatinate, 41 years old, was brought to the surgical clinic in Heidelberg, with the following history:

On June 15, 1876, the patient was engaged in raising a paving-stone out of the ground, when a blow on the stone by means of a sharp pick caused several large and small splinters to fly off, one of which struck the right auricle and remained fixed at the opening of the external meatus. The patient attempted its removal with his hand, but was so awkward about it that the splinter was pushed more deeply into the canal. The same day he went to Dr. X., who, *without any preliminary examination*, attempted to remove it by means of a grooved forceps, which occasioned a flow of blood. Violent pain then set in, on account of which he consulted, on June 18th, another physician, Dr. Y. This physician also, *without any examination*, made further forcible, very painful efforts at extraction, which were accompanied by convulsions of the right side of the face and a hemorrhage. These convulsions were so considerable that the patient called the attention of the physician to them, without, however causing him to desist from further fruitless efforts at extraction.

The convulsions continued during the day, but ceased the following day, and have not returned since. On June 19th there was a purulent discharge from the right ear; the pain has been inconsiderable, but, on the other hand, he has almost continuous dizziness. The night after his admission to the clinic he hawked up some blood, which seemed to him to have "trickled into his throat."

On July 1st, 9 A. M., an examination was made by Prof. Lossen under chloroform. Result—No foreign body visible, *M. T.* perforated.

At 12 M. the same day I examined the patient at the ear-clinic.

Status præsens :—The opening of the external meatus suffused with blood, the middle portion swollen and granulated on the posterior wall; no foreign body visible.

That a perforation of the *M. T.* existed was proven by the fact that water injected into the tube flowed out at the external meatus. Moreover, there was a paralysis of the muscles supplied by the right facial nerve and complete loss of hearing power for watch and speech.

Ordered—Complete rest, occasional instillations of warm water into the external meatus.

Temperature—Morning, 39.0 C.; pulse, 120. A chill late in the evening.

July 2d.—Morning temp., 38.5; pulse 90. Small hemorrhage from the right ear, dizziness; pupils equal. Ice bladders to the head. Instillations of warm water. Evening, pulse 120; very feeble.

July 3d.—After a good night's sleep, pulse 120. Continuation of the iced applications.

At 12 M. I saw the patient again for the first time since the second day. He was very anemic, and showed the highest degree of weakness. He understood questions with great difficulty. In the external meatus up to the incisura intertragica there was a large blood-clot. After its removal, and immediately after washing the ear out with a rubber syringe, there suddenly came a stream of from 3 to 4 ounces of dark blood. The swelling of the meatus was diminished.

The *M. T.* was seen to be perforated, and beyond the opening, dark, fluid, pulsating blood. After the examination the patient fell into a fainting fit, which lasted for some minutes.

The instillations of warm water were discontinued. In the course of the day some pus flowed out of the ear; the right lower extremity was smaller in places and painful. In the evening, pulse 100. He passed the night of July 4th quietly under the use of ice. Toward mid-day renewed hemorrhage and chill. Evening, pulse 96, very irregular.

In the night of July 4th–5th he was very restless, spat a great deal of blood, and sprung often out of the bed. Toward morning, delirium. Conjunctiva and skin of a yellowish tinge. Intense headache and thirst. Urine contains albumen and biliary coloring matter. Continuous pain in the right leg. Evening, pulse 120.

July 6th.—Skin intensely yellow. Temp. very high. Excessive flow of pus from right ear.

Toward mid-day the patient scarcely replied to questions. Tongue dry. Respirations laborious. He died the following evening at 7 o'clock without any further symptoms on the part of the brain.

Sectio cadaveris, fourteen hours after death, by Prof. J. Arnold.

Well-marked rigor mortis ; intense yellowness of the skin ; the right thigh somewhat the thicker ; the skin discolored, green, over a great extent of surface : it, as well as the right calf, pitted on pressure.

Subcutaneous cellular tissue moderately rich in fat ; muscular tissue dark red and glistening.

Corresponding to the discoloration of the right lower extremity, there is a purulent infiltration of the muscular tissue in a more or less advanced state of decomposition. Veins on both sides normal.

In the *pericardium*, yellowish serum.

In the *heart*, a quantity of clotted blood ; endocardium and valves of both sides, apart from the yellowish color, normal.

The *myocardium* of both sides of the heart showed a normal thickness and consistency.

In the left pleural cavity, a moderate quantity of yellow, offensive fluid. The plura costalis and pulmonalis are lined with yellow coating, and in some places it is of a deep red, in others of a more yellowish or greenish tinge. Turbid mucous in the *bronchi.* Branches of the a. pulmonalis free.

The tissue of the *upper lobes* contains air and is elastic, moderately supplied with blood, and œdematous ; the upper back portion has somewhat less air, is very œdomatous and congested. The *lower lobes* in general elastic, tolerably congested and moderately œdomatous. The tissue so affected is infiltrated with larger and smaller cell-collections, which are broken down for the most part in the centre, and resemble cavities containing sanious pus. At the periphery there is a zone of yellow, infiltrated tissue, and the sound tissue is separated from the collections by a dark-red zone (?).

Right lung.—Throughout a great extent it is united to the costal wall by means of a tolerably firm pseudo-membrane. Bronchi and art. pulmonalis as on the left side.

Tissue of both upper lobes contains air, is elastic, moderately œdomatous and congested. In the lower lobes many collections of the same character as those on the other side.

Spleen large, tight, congested, soft.

Left kidney large ; cortical substance slightly congested ; general yellowish discolorations ; extremely dull ; medullary substance somewhat congested.

Right kidney in essentially the same condition, only the dulness and swelling are greater.

In the *gall bladder* a good deal of brown liquid bile.

The liver is adherent by its anterior substance to the diaphragm. Tissue congested. Acinous structure preserved ; centre of acini somewhat dull ; the skull-cap thin but compact ; sutures normal ; dura mater generally of a yellowish color ; a recent blood spot in the *sinus longitudinalis.* In the lateral sinus there was a recent clot, not adherent to the walls.

Pia mater over the cerebral hemispheres strongly infiltrated with serum, more on the right side than on the left ; somewhat dull. Dense infiltration in the pia and arachnoidea at the base of the brain. Over the pons the soft cerebral covering was discolored. Corresponding to the clivus the dura mater was covered with a very vascular tissue, which was studded with ecchymoses, and was very thick on the right side.

Aside from a moderate filling of the vessels and œdema, the *substance of the brain* presented nothing of special moment.

Anatomical diagnosis :—Metastatic septicæmia from wounding of the ear ; metastatic foci in both lungs, as well as in the muscular tissue of the right lower extremity.

Examination of the right petrous bone.—The external meatus filled with a dark, tolerably thick blood clot. *Cutis of external meatus* swollen and covered with a greasy secretion. On the posterior wall, at the point where it passes into the bony meatus, it is thickly granulated. Bony meatus deprived of its periosteum. The last third of the lower wall hyperæmic and in places rough (commencing caries).

M. T. gone, with the exception of a part of the anterior edge, which is loosened from the annulus and partially displaced toward the ostium tympanicum tubæ. The *wall of the labyrinth* is deprived of its periosteum. The *hammer* is drawn inward and upward. The end of the handle rests on the anterior edge of the oval window. The stapes not seen. The incus is preserved. The end of its long process rests on the posterior wall of the oval window. At the point where the chorda tympani leaves the canalis facialis there is an irregular opening about the size of a lentil, through which a thick probe can be passed a short distance into the canalis facialis.

The chorda tympani is destroyed up to near its entrance into the fissura Glaseri. In the *floor of the tympanic cavity*, an obliquely oval opening, whose long diameter is about ½ *cm.*, with a transverse diameter about half the length. This opening leads into the vena jugularis, whose inner wall is infiltrated with pus and yellow for the extent of about ½ *cm.*

No sign of a fragment of stone anywhere.

Since the condition of the labyrinth did not appear to offer anything which could throw any light upon the case, and as it was desired to preserve the preparation, which was not mine, for the collection of the Pathological Institute, an examination of this structure was not made.

Every one will agree with me, I think, when I express the opinion that *the fatal termination is, unfortunately, due to the interference of the physicians.* How much is to be laid to the first and how much to the second practitioner it is now difficult to say. It would be of no practical importance to decide the matter unless the case should come before a court of justice. *From a scientific point of view both have committed an error in treating the case without a preliminary examination.* If the foreign body had remained in the ear the patient would be living today!

As immediate consequences of the forcible interference are to be reckoned: The destruction of the chorda, the peeling off of the periosteum, and mucous membrane of the bony wall of the meatus and of the wall of the labyrinth, the altered position of the first two ossicles, the opening in the canalis facialis, and in the floor of the tympanum, provided, that there was not a dehiscence in both regions, of which I, however, have found no evidence by the closest scrutiny of the petrous bone. Fridlowsky* has described such a condition in the lower tympanic wall; no description of one at the place where the chorda leaves the canalis facialis is known to me. If we admit that the two openings in the bone, of the size indicated, were formed later,—which is improbable from the circumstance that the pain was inconsiderable from the 18th of June,—then must the efforts of extraction, which yet were the primary cause of their existence, have been violent in the highest degree, more particularly as the anatomical relations of the affected region were normal before the accident!

CONCLUDING REMARKS.

In the introductory to the first series of autopsies in Ear Diseases, in the third volume of these Archives, p. 173, I said: "If the careful reader find some data which are of value not alone to the specialist, but to the general practitioner, I beg to state that the credit is primarily due to those of my colleagues who so liberally furnished me the histories and material."

I can, in looking back over this second series, only repeat these words. The building up of a scientific otology is in fact only possible when physicians, clinicians, and pathologists, show such a warm interest and helping disposition toward the aurist, as is revealed in the foregoing communication. Only in this way can the material for scientific research be furnished. That this mutual assistance has been a mutual advantage in the cases above described the reader will certainly willingly acknowledge when he bears in mind that they, though few in number, have not been limited to the domain of otology, but have, almost to the same extent, entered into clinical medicine, surgery, ophthalmology, psychiatrics, and forensic medicine.

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* In the 12th chapter of Diseases of the Ear, by Toynbee, it is recorded that he found in 1013 sections of ears, the lower tympanic wall defective 25 times; whether this condition was always pathological, or whether the instances of dehiscence were included, is not clear. It is expressly said in regard to the upper wall: "In many preparations this layer (the upper bony roof of the tympanum) is partially defective, and the dura mater of the petrous bone comes in immediate contact with the mucous membrane of the tympanic cavity" Of the canalis facialis it is said: "It not infrequently occurs that the inner bony wall of the canal is defective, and in this manner the mucous membrane of the tympanum is in direct contact with the outer surface of the nerve, etc." In regard to the defective development of the lower tympanic wall, nothing special is said.

A CASE OF OBJECTIVE AURAL SOUNDS.

BY DR. E. L. HOLMES, OF CHICAGO.

MISS C. M., 17 years of age, seamstress, suffered in early childhood from a disease of the ears, which she cannot describe. Since that time she has been very slightly deaf, colds having but very little effect on the hearing. She does not remember that she ever suffered from otorrhœa.

The patient has always been pale and quite delicate, and is evidently at present depressed by overwork and confinement. She is often troubled with a light cough. The thyroid gland is somewhat enlarged. At times there have been spasms of the muscles of the left forearm and left side of the chest.

There are involuntary spasmodic elevations of the larynx, as in swallowing, accompanied by a peculiar sound in each ear, distinctly audible at the distance of eighteen inches from the patient on the left side, and five or six inches on the right side. The patient cannot remember when, in childhood, these two phenomena did not exist.

I can best compare the sound to that produced by a firm sudden rubbing of a lock of one's hair near the ear, or by a single sharp mucous râle. I can quite well imitate the sound by rubbing the edges of the thumb and finger nails *obliquely* over each other.

Each sound can be subdivided into a louder first part, and a second part less loud; and yet each sound is quite short. They occur, as also the spasms of the pharyngeal muscles, nearly forty times a minute. They also remit as regards the intensity and the intervals. The patient states that the sound in the right ear seems like a faint echo of the sound in the other ear, following it at a very short interval. The act of swallowing, or holding the breath increases the distinctness of the sounds. "A cold in the head" diminishes it, but does not greatly increase the deafness.

The sound seems invariably to proceed from the external meatus. When the patient holds her mouth wide open, the ear of the examiner held near the mouth and nostrils, still hears the sound, but indistinctly and as if coming from a distance.

Prof. H. M. Lyman made a careful auscultation of the mouth, side of throat, and region of the ears with me, and was positive that the origin of the sound appeared to be in the ears alone.

The external meatus presents no abnormal appearances. The membranæ tympanorum are thin and translucent, except in the central and upper portions, which are white and thick. The transparent portion of the membranes are moved by Valsalva's method of inflation and also very slightly *with each spasm of the pharyngeal muscles.*

From the condition of the patient's health, especially from the fact that she was possibly suffering from chorea, I was induced to prescribe Fowler's solution, cod-liver oil, quinine and iron, exercise in the open air, and rest from close confinement.

This treatment, continued and omitted from time to time for a year, improved the patient's general health without change in the special symptoms.

Meantime the patient at my request had been under the observation of Dr. E. F. Ingals, who had enjoyed an extensive experience in the practical use of the laryngoscope. He states that the mucous membrane of the throat is not noticeably congested. A thin muco-purulent fluid bathes the orificies of the Eustachian tubes. He further states that synchronous with the spasm and sound, the contraction of the leavator veli palati and of the tensor palati mollis, respectively raises the velum and separates the labii of the Eustachian orifices.

There are, perhaps, three factors to be considered in discussing the cause of the sounds. 1st. The separation of the walls of the Eustachian tubes near their opening. 2d. The passage of air into the middle ear with each contraction of the pharyngeal muscles, and 3d, possibly most important, a spasmodic contraction of the tensor tympani.

I did not try any experiments to ascertain whether the apparent pitch of the tuning-fork was modified during the spasms.

Such cases are quite rare, a few only being reported in works on otology and in otological journals.

In 1854 I had an opportunity to examine a most interesting case under the care of Prof. H. J. Bigelow, who had reported its history in the *Boston Medical and Surgical Journal*, November 3, 1847. In this patient, a young lady about 16 years of age, the sound, a sharp "click" audible across the room, appeared to come from the throat. I have been informed by Prof. Bigelow that this patient and another similarly affected, which subsequently fell under his observation, finally recovered. Unfortunately when these patients were under observation, the rhinoscope was practically unknown. There were possible cases, in which the spasms of the pharyngeal muscles were not attended with a synchronous spasm of the muscle in the middle ear.

FOUR CASES OF INTRACRANIAL DISEASE CAUSED BY CHRONIC SUPPURATION OF THE MIDDLE EAR.

Two Recoveries and Two Deaths.

By CHARLES J. KIPP, of Newark, N. J.

MY object in bringing the following cases to the notice of the profession is twofold: First, to show that recovery from well marked intracranial disease supervening in chronic suppuration of the middle ear is not so rare an event as it is commonly supposed to be; secondly, to urge the use of the ophthalmoscope as an aid in the diagnosis of intracranial disease of this character.

I am well aware that the ophthalmoscope has been used for this purpose by many physicians for years past, but a glance at the cases of brain disease following purulent inflammation of the middle ear, published even within the last few years, will show that the practice is as yet very far from being general.

During the last two years I have made frequent ophthalmoscopic examinations of all my cases of acute and chronic suppuration of the ear, presenting symptoms of intracranial disorder, such as fever, severe headache, vertigo, nausea, vomiting, etc. The total number examined I am not now able to state, but it is certainly over fifty. Optic neuritis was present only in the four cases reported below; two of these recovered their health entirely, and the other two ended fatally. All the cases in which no optic neuritis was found, recovered from the suspected intracranial disease.

The following cases are mentioned in the order in which they came under observation:

1. *Chronic purulent inflammation of the middle ears. Meningitis. Double optic neuritis. Paralysis of the external rectus muscle of the right eye. Recovery.*

Florence H., æt. 5, a well developed, healthy looking child was sent to me by Dr. J. W. Corson of Orange, N. J., in November, 1876. From the child's parents I learned that up to a year ago the child had been in good health and free from ear disease of any kind. At that time she had an attack of tonsilitis which was followed by earache and discharge from both ears. During the past year she has had measles and a sharp attack of diphtheria. The otorrhœa and the deafness continued.

On examination I found nothing abnormal about auricle and mastoid process of the right ear. The external auditory canal was full of offensive pus, after the removal of which the walls of the bony portion were seen to be red and swollen. In the posterior half of the drum membrane was a large perforation, and the remnant of the membrana tympani and the exposed lining membrane of the promontory were covered with granulations. Air could be easily forced through the perforation by Politzer's method, and water injected into the ear escaped through the nose. The *left* ear was in about the same condition as the right. The ticking of a watch which is heard by the normal ear at one and a-half metre, was heard only when pressed against either ear. I applied with a cotton-holder a strong solution of the nitrate of silver to the granular surfaces, and ordered frequent and thorough syringing with warm salt water, and instillations of a one per cent. solution of sulphate of zinc. As the general health was good no constitutional treatment was advised.

Ten days later I saw the girl again. She was very irritable and complained of much pain in and about the right ear. I noticed at once that the integument of the right mastoid process was swollen and red, and that the swelling was greatest immediately behind and above the insertion of the auricle. No fluctuation could be detected. With the exception of considerable swelling of the posterior wall of the external canal, this, the drum membrane and the promontory were in about the condition described above. The Eustachian tube was permeable. The otorrhœa continued.

There was no change in the left ear.

I ordered two leeches to the swollen part, to be followed by poultices, and instillations of warm water into the right ear. The left one was treated as before.

Under this treatment the swelling of the mastoid and the posterior wall of the external canal subsided in about a week. In December the child passed through an attack of scarlatina which again brought on the earache, increased the otorrhœa, and left her in a very debilitated condition.

During the following three months the patient regained her former healthy appearance. The granulation which had again developed during the scarlatina, disappeared under the application of the nitrate of silver; the discharge gradually diminished in quantity, and the hearing was slowly improving. But in the early part of March she became feverish, restless and very fretful; she was delirious at times; complained of severe headache; was nauseated; vomited occasionally, and was constipated. At about the same time the walls of the right external canal became so much swollen that the drum membrane could not be seen, and the discharge from the ear ceased almost entirely. Some days later the parts anterior to the tragus began to swell, and in a short time the entire right side of the face was excessively œdematous. The integument of the swollen part was neither shining nor red. The lids of the right eye were so much swollen that it was difficult to open them, but the eyeball was not protruded or its mobility impaired in any direction. With the exception of slight pale chemosis, the anterior parts of the eye presented nothing abnormal. The interior of the eye could not be examined on account of the great intolerance of light. No fluctuation could be detected at any point in or near the swollen part, and a comparison of the jugular veins of the two sides failed to discover any difference in fulness. The integument of the mastoid was neither red nor swollen.

The left ear was entirely free from pain.

The treatment agreed upon by Dr. Corson and myself consisted in small doses of calomel, extract of hyoscyamus, and bromide of potassium. The instillation of warm water was continued, and the swollen part put up in cotton batting.

For about a week there was little change in the condition described; then the fever slowly passed away, the otorrhœa became again more copious, and the swelling of the face gradually subsided.

On March 23d the right external canal was again of normal calibre; the remains of the drum membrane was of a grayish color, and the lining membrane of the promontory, although still swollen, was much smoother than I had seen it at any time. The left ear was almost dry. As the headache and vomiting continued, I made another attempt to view the interior of the eyes, and this time succeeded. I found both disks swelled but transparent, their margins indistinct and the retinal veins very full and tortuous. There were no white plaques on the disk or in the retina in either eye. Iodide of potassium was substituted for the calomel. During the month of April the ears remained in about the condition last described. The cerebral symptoms were at times better, at others worse; but they did not prevent the child from occasionally taking part in the amusements of its playmates. The optic disks continued to swell, and assumed a light grayish-red color. Their margins became entirely obliterated. The retinal arteries were of about normal size, but the veins were enlarged and very tortuous. No extravasation or white plaques could be seen on the disks or in the retina. Vision was apparently not impaired.

In the beginning of May the child's strength failed visibly, and in addition to the symptoms above enumerated she had also convergent strabismus (paresis of the external rectus muscle) of the right eye and very marked stiffness of the neck. The optic neuritis was at its height. There was no change in the condition of the ears.

With the exception of a diffuse swelling of the right side and the back of the neck, without redness, heat or fluctuation, which made its appearance in the latter part of May and continued for about two weeks, there was but little change in the child's condition during May and June. In July there was a marked improvement in all the symptoms. The child had regained sufficient strength to be out in the garden during the greater part of the day; had but little headache, and was free from attacks of vomiting. Her appetite was excellent. The squint disappeared entirely, and the optic neuritis was slowly subsiding.

During August there was a slight relapse of the head trouble which lasted for about two weeks.

In October the optic neuritis had completely disappeared. The optic disks were somewhat whiter than normal, and their margins were well enough defined. The retinal vessels were of about normal calibre. The ears remained in the condition described.

I last examined the child on January 7, 1879 (twenty-six months after she was first seen by me), and found her to be in excellent health.

There was still occasionally some discharge from the ears. In both the remnant of the drum membrane was of a grayish color, and the handle of the malleus plainly visible. The lining membrane of the promontory was pale and smooth. With the right ear she could hear the watch at 8 *cm.* ($H=\frac{8}{150}$), and with the left at 5 *cm.* ($H=\frac{5}{150}$). All traces of the optic neuritis had disappeared. The optic disks and the retinæ were normal in appearance. The sight was perfect ($S=\frac{6}{6}$ in both).

No one will doubt, I think, that in the above case the headache, the fever, the vomiting, the squint and the double optic neuritis were caused by a meningitis at the base of the brain. It is also probable that thrombosis of the right lateral sinus and jugular vein was present at the same time, and caused the extensive œdema of the entire right side of the face, and the diffuse swelling of the right side and the back of the neck. The recovery from the intracranial disorder was as complete as it was unexpected, and should encourage us to take a more hopeful view of the termination of such cases than is usually done.

II. Chronic purulent inflammation of the right middle ear. Central caries of the mastoid cells. Abscess of right middle lobe of brain. Thrombosis of right lateral sinus. Double optic neuritis. Death.

Patrick F., æt. 23, a robust laborer, presented himself at the clinic of the Eye and Ear Infirmary of St. Michael's Hospital, on June 10, 1878, with the following history: Does not remember to have had ear trouble before a year ago. At that time he had severe earache which was soon followed by otorrhœa. Both passed away in a short time but have returned occasionally since then. Has never had syphilis.

A week ago he was suddenly taken with severe pain in right ear, and a few days later the pain extended over the entire right side of the head. The otorrhœa has been profuse since this attack began. Does not remember to have had a chill.

Present condition.—Patient has a very anxious expression and seems to suffer severe pain. He has no fever. Pulse 90. The right external ear and the parts around it are neither red, swollen, nor sensitive to pressure. The external canal is capacious and filled with pus, and the walls of the same are red but not swollen.

The drum membrane is of a bluish-red color, very much thickened and excoriated. In its lower anterior segment is a small perforation through which pus and air escape with difficulty on inflation of the middle ear. The ticking of a watch at 150 *cm.* normal hearing distance, is heard only when it is pressed against the auricle. Patient complains of severe pain in ear and head. Is not sick at stomach. The ophthalmoscopic examination shows the optic disks and the retinæ to be normal.

The perforation was enlarged downwards, and he was ordered to syringe his ears with warm salt water, and to make frequent instillations of a warm one per cent. solution of sulphate of morphia.

June 14th.—Patient returned with the statement that the pain in his ear and head was no better. Condition of ear as before. Admitted to the hospital.

June 15th.—Headache very intense and constant. Movement of head increases pain. Marked stiffness of neck. No nausea or vomiting. Constipation. Pulse 96. Temperature in the evening 38.6 C. (101½ F.).

Profuse otorrhœa. Loud perforation noise on inflation. Ordered ice-bag to the head and administered 0.6 gram of calomel. At night he was given 0.02 gram of sulphate of morphia.

June 16th, 10 A.M.—Slept part of night. Bowels moved during night. Temperature early this morning 37.7 (100 F.). Had a chill an hour ago. Is now in a fever, and is vomiting. Headache excruciating. Mind perfectly clear. Margins of optic disks indistinct. Retinal veins very full. Otorrhœa profuse. No evidence of disease of mastoid cells. 8 P.M.—Vomited several times through the day. Took 0.02 gram of sulphate of morphia at noon. Headache is somewhat better. Is slightly drowsy. Pupils small and responsive to light. Appearance of fundus oculi as before. Pulse 106, soft and full. Temperature 39.4 (103 F.). Injected 0.015 gram morph. sulph. under skin.

June 17th, 8 A.M.—Had a tolerably good night. Vomited after breakfast. Has less headache. Temp. 38 (100½ F.). Skin cool. Pulse 80. Ear and eyes unchanged. 8 P.M.—Headache worse again. Mind quite clear. No vomiting since morning. Temp. 37.7 (100 F.). Pulse 80. Has great pain in ear. Otorrhœa very profuse. Perforation noise is loudly heard on inflation. Appearance of ear and eye about the same as before.

June 18th, 8 A.M.—Pain in head continues, notwithstanding large doses of sulph. morph. No vomiting. Temp. 38.5 (100½

F.). Pulse 80. 8 P.M.—No change. Temp. 37.7 (100 F.). Pulse 78.

June 19th, 8 A.M.—Headache continues. No vomiting. Temp. 36.9 (98.5 F.). Pulse 75. 8 P.M.—No change. Temp. 37.2 (99 F.). Pulse 75.

June 20th, 8 A.M.—Says that with exception of slight pain in right temple he feels quite well. No change in condition of ear. Temp. 37.2 (99 F.). 4 P.M. No change. Found him in lively conversation with a friend. Temp. 37.2 (99 F.). Optic disks swollen and retinal veins swollen and tortuous.

June 21st, 8 A.M.—Slept pretty well although his head pained him a good deal. Early in the morning he had a series of general convulsions, lasting half an hour altogether. Was unconscious. Eyes widely open and fixed. Foamed at the mouth. Is now very weak and apathetic. Ear and eyes as before. Temp. 38.3 (101 F.). Pulse 100. 8 P.M.—Since morning constant vomiting of a blackish fluid. Is slightly drowsy but answers questions promptly and rationally. Complains bitterly of pain in head. Has also tenesmus and pain in bowels. Tongue moist and not coated. Pupils of same size, small and active. Optic disks of grayish-red color and much swollen. Margins entirely obliterated. Vessels as before. No white plaques on disks or in retinæ. Says that he sees as well as ever. Ear as before. Temp. 37.7 (100 F.). Pulse 100.

June 22d.—Headache unbearable. Vomiting has ceased. Pain in bowels and tenemus have disappeared. Otherwise no change. Morning temp. 38.3 (101 F.). Evening temp. 38.8 (102 F.). Pulse 100.

June 23d.—No change. Morning temp. 39.4 (103 F.). Pulse 110. Evening temp. 38.3 (101 F.). Pulse 100.

June 24th.—No change. Morning temp. 37.7 (100 F.). Evening temp. 38.3 (101 F.). Pulse 90.

July 2d.—During the past week there has been but little change in his condition. The pain in the head has been continuous and exceedingly severe. There has been no return of the vomiting, and his bowels have been regular. He has had no pain in any other part of his body, and no paralysis of any part. His mental faculties have been unimpaired until to-day; now he is quite drowsy. The otorrhœa is still very copious. There is no change in his pupils and the optic disks remain as last noted. The temperature during the first days of the week was 37.7 (100

F.) in the morning, and rose to 38.3 (101 F.) in the evening. Since then it has varied between 36.9 (98.5 F.) and 37.2 (99 F.). The pulse was at no time below 75 or above 80. To-day the temp. is 37 (98.75 F.). Pulse 72, soft.

July 3d.—Stupor increased, otherwise no change. Temp. 37.2 (99 F.). Pulse 72.

July 4th.—Coma. Died at 6 P.M.

During the last two weeks of the patient's illness, the treatment consisted of the application of the ice-bag to the head, and of subcutaneous injection of large doses of the sulphate of morphia. The ear was very frequently syringed with warm salt water, and the middle ear was inflated at least once a day.

Autopsy 19 hours post mortem.—Only the head was examined in consequence of the advanced decomposition of the body. Dura mater of convexity normal in appearance. Longitudinal sinus filled with fluid blood. Pia mater of convexity hyperæmic. No fluid in subarachnoid space. On lifting brain out of skull a large quantity of very fetid pus escaped from under surface of right temporal lobe. On examining this part an abscess of the size of a hen's egg was found, separated from the dura mater only by a very thin layer of discolored brain substance. In the thinnest part of this layer was an irregular opening through which part of the pus had escaped. The abscess was not lined by a membrane, but the cerebral tissue surrounding it was of a dark color for a distance of about 5 *mm.*, and somewhat firmer than the rest of the brain. No other lesion of the brain could be found. The ventricles contained about the usual quantity of serous fluid.

The dura mater over the tegmen tympani et antri mastoidei was of a light leaden color, but not thickened or ulcerated. There was no pus between the dura and the bone.

On removing the lateral sinus out of the sulcus a quantity of puriform fluid escaped, which was found to come out of a round opening, about 5 *mm.* in diameter, in the anterior and outer walls of the sinus. The hole was surrounded by softened tissue. The entire sinus was filled by an organized reddish thrombus, in the centre of which, corresponding to the deficiency in the wall, was a cavity containing puriform fluid. Above and below this puriform fluid, the thrombus was firmly adherent to the walls. The thrombus projected also a short distance into the the internal jugular vein but was not adherent to the inner coat. There were no thrombi in the petrosal sinuses.

The temporal bone was removed, and examined after maceration in diluted alcohol for several weeks. The inner surface of the bone was perfectly smooth everywhere and of normal color except at tegmen tympani et antri, and in the sulcus lateralis where it was of a light bluish-red color. (Before maceration no discoloration of bone was apparent.) The discolored parts were no softer than those of normal color. The tegmen tympani et antri was of average thickness. The tympanic cavity contained pus. Its lining membrane was of a livid color, greatly swollen and studded with large granulations. In the lower anterior segment of the drum membrane were two perforations, each about 2 *mm.* in diameter, and separated by a narrow bridge. The ossicles were in normal position. The head of the malleus and the body of the incus were carious. The stirrup was entirely hidden by the swollen mucous membrane and was apparently normal, but almost immovable. No caries of the wall of the tympanum could be discovered. The antrum was rather small and its lining membrane was swollen and covered by offensive pus. The mastoid cells were rather small and filled with very fetid pus. The intercellular bony septa were carious in many places. The inner and outer lamellæ of the mastoid process were of healthy appearance and average thickness. The bony external canal was not carious.

The Fallopian canal with the facial nerve, the semicircular canals, the vestibule, the cochlea, and the internal auditory canal with its nerves appeared normal to the naked eye ; they certainly contained no pus. The pyramid was carious in no part, but in a few circumscribed places it was of a reddish color.

In this case the existence of an abscess in the brain was inferred from the agonising pain in the head, the rigor, the convulsions and the double optic neuritis, but the phlebitis and thrombosis of the lateral sinus were not at all suspected. The entire absence of the usual symptoms of thrombosis of the sinus is certainly one of the remarkable features of this case. Another point of interest is, I think, the combination of abscess of the temporal lobe and phlebitis of the lateral sinus.

With regard to the channels through which the disease extended from the temporal bone to the brain and to the sinus, I am unable to give any positive information. But as the inner surface of the temporal bone was at no place carious (although slightly discolored at the tegmen tympani and in the sigmoid sulcus after maceration), it seems probable that the inflammation extended along the vessels from the mastoid cells to the sinus, and from the middle ear to the brain.

From amongst the interesting features of the otitis may be named the continuance of the profuse otorrhœa till the very day of death, and the existence of caries of the central part of the mastoid process, without even the slightest œdema, pain or redness of the external covering of this process.

Had the patient fallen into competent hands at an earlier day, the otitis could probably have been arrested and the intracranial disorders prevented.

III. Purulent inflammation of right middle ear. Abscess of mastoid cells. Abscess of back of neck. Meningitis. Double optic neuritis. Recovery.

Mary O'R., æt. 16, a well-developed healthy-looking girl, was admitted into St. Michael's Hospital on October 28, 1878.

Ten years ago she had measles, followed by an otorrhœa which has continued to the present time. Was under treatment for a while, but as the improvement was not marked, stopped all treatment except syringing with warm water. In the latter part of September she had some pain behind the ear, and thinks it was caused by washing her hair, which was long and thick, and going to bed without thoroughly drying it. The pain continued to increase in severity for about two weeks. The treatment consisted of poultices and an application containing carbolic acid. About two weeks after the pain first commenced, noticed some swelling of mastoid region. The swelling extended, but nothing more was done for two weeks more, when she had a severe chill, followed by high fever and profuse perspiration. A physician was then called, who incised the swelling in its upper part and ordered a poultice to the same. After a few days another incision was made in the same region. As the treatment did not give the desired relief, she was brought to the hospital on October 28th. Dr. William Rankin, Jr., who had charge of the eye and ear department during my absence from the city, saw the patient in the afternoon of that day, and found her greatly excited. Pulse 150. Skin hot and dry. The ear was discharging freely. The whole mastoid region was much swollen, hot, red and fluctuating. At the upper part was an opening from which a mass of granulations was protruding, and through which pus escaped on pressure. A large incision was made immediately posterior to the auricle, and the abscess evacuated. A drain-tube was inserted and a poultice applied. Frequent syringing of the ear and perfect quiet were ordered. Sulphate of morphine was given at bed time.

On the following day there was but little change in the patient's condition. The excitement continued. The ear and the wound discharged freely. No necrosed bone could be discovered. Her appetite was good and the bowels were regular. She was ordered to take 0.12 gram of sulphate of cinchonidia three times daily, and the stimulants which she had been taking freely, were discontinued.

Next day she was more quiet, but otherwise her condition was unchanged. In the evening the temperature was 38 (100.5 F.).

On the following day she was able to sit up in bed. An ophthalmoscopic examination was made and optic neuritis discovered in both eyes. The discharge from the ear and from the wound continued. Morning temp. 38.6 (101.5 F.). Evening temp. 39.15 (102.5 F.).

Three days later the patient was sufficiently well to entertain a number of friends who called on her, but in the evening she became very feverish and the temperature rose to 39.5 (103.25 F.).

Next morning the temperature had fallen to 38 (101.5 F.). A polypus was removed with the snare from the middle ear, and a quantity of fetid pus evacuated. Evening temp. 38.8 (102.5 F.).

During the next two days there was no change.

On the seventh day of November, I saw the patient for the first time. She was then suffering from intense mental excitement and was very feverish. The morning temp. was 39.4 (103 F.) She was complaining of pain in her ear and in the back of her head. There was profuse otorrhœa. On the posterior wall of the osseous external canal was a mass of granulations and in the membrana tympani a very large perforation. The lining membrane of the promontory was granular. Inflation by Politzer's method produced a loud perforation noise. The mastoid region was but little swollen. The incision made by Dr. Rankin was still open and discharging. On examining the occipital region I found an immense abscess which extended a considerable distance down the back of the neck. This abscess was opened by a long incision and a large quantity of purulent fluid evacuated. No carious bone could be detected, and attempts to pass a probe from the abscess to the opening behind the ear failed. A large drain tube was inserted into the abscess, and a poultice applied over the whole swollen region.

Examination of the eyes revealed considerable swelling of the disks, obliteration of their margins, and marked fulness and tortuosity of the retinal veins. The disks were of a light grayish red color, but tolerably transparent. No white plaques or hemorrages were found on the disks or in the retinæ.

The patient had a good appetite, had no nausea or vomiting, and her bowels were regular. Evening temp. 38.8 (102.5 F.). The sulphate of cinchonidia was continued.

On the following day the temp. was 37.2 (99 F.) in the morning, and 39.15 (102.5 F) in the evening. There was a profuse discharge from the abscess in the back of the neck. The otorrhœa continued.

Next day she complained of pain in the right shoulder, which was found to be red and swollen; otherwise there was no marked change. Morning temp. 37.2 (99 F.) Evening temp. 39.4 (103 F.) The painful shoulder was wrapped up in cotton batting.

On the following day the swelling of the right shoulder had nearly passed away, and the shoulder was no longer painful on motion.

Two days later she had a severe chill followed by fever and sweating. No marked change in ear or eyes; abscess still discharging. On the following day the mastoid process was again somewhat swollen and painful. Otherwise her condition was unchanged. Reopened incision over mastoid and found a large fistula leading into antrum. At the same time I removed with the snare the mass of granulations from the posterior upper wall of the bony external canal. Water injected into the ear escaped freely through the fistula and also through the Eustachian tube. A piece of an elastic catheter was inserted into the fistula. The discharge from the abscess continued. Patient's general health was good.

Two days later the parts in front of the ear and the right temple became swollen, red and painful. No fluctuation could be discovered.

On the following day the tumefaction involved the lids of the right eye. There was no protrusion of the eyeball and its mobility was unimpaired. The swelling of the face continued to increase for two days, and then gradually passed away. Slight desquamation of cuticle followed.

The swelling of the optic disks was now at its height. Their surfaces were distinctly visible with a + 4 D glass, while at the maculæ luteæ the eyes were emetropic. The disks were of a reddish-gray color, but not very opaque. Innumerable small blood-vessels covered their surfaces.

The margins of the disks were completely hidden. No white plaques could be seen on the disks, but in the retina of the right eye, a short distance inwards of the papilla (upright image) was a whitish spot with ill-defined edges, and about one half the diameter of the disk in size. A retinal artery was distinctly visible on this spot. No extravasations could be seen in either retina. Vision was normal in both eyes.

From this time on the patient was free from fever. The abscess in the neck gradually filled up with granulations and then closed. After the removal of another polypus from the external canal, the otorrhœa rapidly diminished in quantity ; the drain tube in the fistula of the mastoid process was then removed, and in a short time the wound was closed by a deep indrawn cicatrix. The swelling of the optic disks continued in a moderate degree at the time of her discharge from the hospital—seven weeks after her admission.

Since then she had attended the Infirmary at irregular intervals as an out-door patient. She was last seen on April 18th, nearly six months after she had come under observation, and was then in excellent health. There was no otorrhœa. The external canal was of normal appearance ; the remnant of the drum membrane was of a grayish color, and the lining membrane of the promontory was pale. She could hear the ticking of a watch at 3 *cm.* ($H=\frac{3}{150}$). The optic disks were of normal color and flat. The whitish spot in the retina had nearly disappeared and a few dots of pigment marked its former outline. The retinal veins were still rather full. Her vision was perfect, ($S=\frac{6}{6}$).

Although several of the most common symptoms of meningitis were absent, I did not hesitate in this case to make the diagnosis of meningitis at the base of the brain. Double optic neuritis is doubtless occasionally developed as a primary affection, but when it is accompanied by headache and fever, and occurs in an individual suffering from purulent inflammation of the middle ear and caries of the mastoid process, I think we can safely assume that it is the result of either meningitis, cerebritis, phlebitis or thrombosis of one or several of the cerebral sinuses. The large abscess which formed at the upper part of the back of the neck was probably the result of a periostitis which had extended from the temporal to the occipital bone. The tumefaction of the face was doubtless due to a mild form of erysipelas which started from the vicinity of the tragus. The inflammation of the right shoulder was so transient that its metastatic nature may well be doubted.

IV. *Chronic purulent inflammation of the middle ears. Meningitis. Thrombosis of later alsinus. Double optic neuritis. Death.*

Miss A. F., æt. 21, consulted me in August, 1874, with regard to deafness and otorrhœa. Disease began in infancy. Has never had much pain in ears. I found in the *right* ear a large perforation in lower half of drum membrane. This membrane was red and thickened, and the exposed end of the handle of the malleus resting against the promontory, the lining membrane of which was very smooth. The Eustachian tube of this side was pervious. Water injected into the ear escaped from the nose and mouth. There was but little otorrhœa from this ear. In the *left* ear there was a large perforation near the upper-anterior periphery of the drum membrane, and another smaller one near the lower periphery. The drum membrane was covered with granulations, and a large mass of granulations protruded through the upper perforation. After this mass of granulations had been removed by the snare, pus and air could be forced through both perforations by Politzer's method. From this ear the discharge was profuse. No exposed bone could be felt through the perforation. A two per cent. solution of nitrate of silver was injected into the middle ear through the perforation and the same solution applied to the granular drum membrane. The patient was ordered to syringe the ears and to instill a one per cent. solution of sulphate of zinc.

A month later I saw the patient again. She reported improvement in amount of discharge. There was no change in the appearance of the ears. The treatment before mentioned was continued.

In October of the same year I had another visit from the patient, and found the ears in the same condition.

After that I did not see the patient again till December 21, 1878, five hours before her death and more than four years after her last visit to me.

On this occasion I saw her in consultation with Drs. Stæhlin and Sutphen, the attending physicians, to whom I am indebted for the following notes. Patient was first seen on evening of Dec. 10th. She was then suffering from very severe pain in both ears. The pain commenced three or four days before. She was feverish and complained of frequent chilly sensations. A cathartic, Quinine and the Bromide of Potassium were given; leeches were applied to the ears, and ice to the sides of the head.

Next day there was but little change in her condition. Short chills followed by fever and perspiration.

Dec. 12th.—Intense lancinating pain in head, proceeding from the ears. In *right* ear large dry perforation of drum-membrane. In *left* small perforation in inflamed drum-membrane, but little muco-purulent secretion in tympanum. Both ears readily inflated by Politzer's method. No evidence of disease of mastoid processes. Ophthalmoscopic examination shows retinal veins full and tortuous, but no other change. Temperature slightly raised above normal, but degree not taken. Ordered perfect rest in dark room. Large doses of sulphate of morphia.

Three hours later patient was free from pain, face flushed, skin hot and dry.

Dec. 13th, A.M.—Temp. 38.8 (102 F.). Pulse 90. P.M.—Temp. 39.95 (104 F.). Very little pain.

Dec. 14th, A.M.—Temp. 40.2 (104.5 F.). Pulse 80. Had slight pain last night. Was relieved by morphia. P.M.—Temp. 39.9 (104 F.). Pulse 106, soft. Has been sleeping some. Skin moist. Tongue coated. Pupils contracted and respond slowly to light. Bowels moved by cathartic. Acts stupid. Substituted hydrate of chloral for morphia. Ice bags to head. No local paralysis. No vomiting.

Dec. 15th.—Severe pain through forehead backwards, during night. Recourse had again to morpnia with good effect, the Chloral failing to relieve the pain. 4 A.M.—Temp. 40.3 (105 F.). 9 A.M.—37.75 (100 F.). Pulse 85, soft. Condition about same as yesterday. Same treatment continued. 5 P.M.—Temp. 37.75 (100 F.) 9 P.M.—Temp. 37.5 (99.5 F.)

December 16th.—A.M. temp. 37.9 (100.25 F.). Pulse 80, soft. Continues stupid. Locates pain now in back of head. Left mastoid process is now somewhat swollen, red and tender on pressure. Made an incision through swollen tissue down to bone. No pus escaped.

December 17th.—Patient has had no pain ; looks brighter ; pupils less contracted. No discharge from incision. Temp. 39.15 (102.5 F.).

December 18th.—No change. Slept more last night. Senses acute. A.M. temp. 38.75 (102 F.). P.M. temp. 37.75 (100 F.).

December 19th.—Still apparently improving. Slight pain in side. Temp. 37.6 (99.75 F.).

December 20th.—Had a convulsion at 2 A. M. Since then she is delirious ; sometimes violent. Seems to suffer from pain, but does not localise it. Throws arms about in an aimless manner. Picks at bedclothes. When aroused assumes a stupid stare, but immediately closes eyes again. Pupils dilated, contracting only slightly when exposed to light. No otorrhœa. No swelling of mastoid region. Passes urine and feces involuntarily. During last two days she has had several attacks of epistaxis. There is now marked optic neuritis in both eyes. A.M., temp. 39.9 (104 F.). Pulse 100. P.M. temp. 39.9 (104 F.). Pulse 104. No change otherwise.

December 21st.—Patient slept two or three hours last night. Recognized physician for a moment ; then her mind wandered again. Temp. 38.8 (102 F.). Pulse 100. Skin dry and hot. Pupils dilated. Nose bled last night. Subsultus.

5 P.M., coma. Cheeks flushed. Skin dry. Temp. 39 9 (104 F.). Pulse 90. Sordes on teeth. Pupils dilated.

Well-marked optic neuritis in both eyes.

10 P. M., death.

No autopsy could be obtained.

Judging from the rapid growth of the granulations protruding through the upper perforation in the drum membrane, it appears probable that the roof of the left tympanic cavity was carious more than four years before her death. Had she remained under treatment the disease could probably have been arrested. With regard to the precise nature of the intracranial disease, it seems most likely that it was a meningitis at the base, and phlebitis of the lateral sinus or the petrosal sinuses. The optic neuritis was not developed till a few days before death.

On looking over the literature of this subject, I have found but two cases of cerebral disease from otitis, in which optic neuritis is mentioned among the symptoms. Both cases recovered. They were observed by Allbutt, and are recorded in his book *On the Use of the Ophthalmoscope*, etc. Appendix. Cases. Nos. 42 and 43. I give them in full:

Rebecca R., æt. 10, was admitted under the author in August, 1867, and was a long time under notice. A few months before, when in excellent health, she had scarlet fever rather severely, and had a discharge from the right ear. On admission, the ear, as tested by watch, was deaf; the watch could scarcely be heard at one and a-half inch, which in a few weeks she was able to hear at eight inches. There were many symptoms of local meningitis at the base such as headache, sickness, strabismus (external) of right eye, etc., which I need not detail at length.

O. S.—Right disk very pink, vessels full, edges indistinct.

Left disk normal, or nearly so.

Reads No. 6 (Jäger) only with right eye. Reads No. 2 with left.

This child remained a long time under my care, and under the use of iodide of iron and cod-liver oil, with occasional use of chalk and mercury, she completely recovered. Her mental faculties, previously much weakened, were restored; her right disk cleared, and the right ear became sensitive to sound. She was threatened, however, with pulmonary symptoms when she was discharged on the family removing elsewhere.

G. H., æt. 11. Scarlet fever at æt. 2, followed by discharge from ear, which still continues (July 2, 1867). Eight years ago had "brain fever," said by the doctor to be due to the otorrhœa. He is decidedly deaf. At present suffers from symptoms of meningitis; is at times strange and almost maniacal in manner; has attacks of intense headache, nausea, occasional vomiting, convulsive attacks, intolerance of light, transient debility of limbs, inability for mental work. These symptoms vary a good deal in frequency and intensity; sometimes is free for several weeks, when he will suddenly run into the house with a violent access of headache. Is always best when ears are discharging freely; they discharge most freely when the boy is warm. The whole neighborhood of the left ear is puffy and tender, especially behind the pinna. In both disks is well-marked ischæmia. The bright œdematous disks stand out steeply, and the vessels ride over them, and the veins are full and dark.

September 17th.—Has been treated with iodide of potassium, cod-liver oil, and small doses of corrosive sublimate. Is better. Has had one fit with unconsciousness. Has still morning nausea. The disks have receded, leaving a more plain surface; their edges are undistinguishable; the vessels are large and dark, and there is still some œdema.

October 15th.—Much as before. Disks flatter and less œdematous.

December 24th.—On the whole much better. Disks as at last report. Yesterday, however, had intense pain in head; screamed and rolled on the floor. Has lately been taking syrup of iodide of iron and cod-liver oil.

December 31, 1869.—Has recovered a good deal from his head symptoms, and his ears are much less troublesome. There is now but little discharge. The edges of the right disks have cleared all round, except quite at inner edge. The left disk is indistinguishable, but the vessels are not distended. Sight in both eyes good, and always has been. Has a cough, and then an evidence of degeneration at both apices.

Both of these cases are of much interest, not only as instances of recovery from meningitis, but also as illustrations of the fact that tuberculosis not unfrequently follows long-continued purulent inflammation of the middle ear.

Besides these two cases of Allbutt's, I have found the record of a case of otitis media purulenta, in which optic neuritis was present, by Wreden, in *Archives of Ophthalmology and Otology*, vol. v, no. 1, page 75. But in this case the intracranial disease was not caused by the otitis, but by a neoplasm originating in the nasal cavity.

CONDYLOMATA OF BOTH EXTERNAL EAR CANALS.

BY H. KNAPP.

THE manifestations of syphilis in the organ of hearing have of late received more attention than in former years. Among the syphilitic affections of the outer ear, condylomatous formations have rarely been described, and, to judge from my own experience, do not frequently fall under the notice of the aural surgeon, for among from 9,000 to 10,000 cases of ear disease. I have seen only one example of them. *Wilde*[*] reports one case, adding that it is a rare form of disease. "A female, aged 25, suffers from deafness, tinnitus, occasional pain, fœtid and sometimes bloody discharge from her left ear, for eight months. The internal meatus is completely closed by several condylomata which grow around its margin, but particularly from its lower edge. They are rather sensitive to the touch, lobulated on their surface, project beyond the margin of the aperture, and are a little more florid in color than the natural skin. When the tragus is pressed backward, a muco-purulent discharge exudes between these growths. The excrescences were touched with nitrate of silver, after which a poultice was applied. The subsequent treatment consisted in washing over the morbid growths with a strong solution of nitrate of silver every second or third day, and, in the intermediate time, keeping a dossil of fine lint wet with diluted liquor plumbi applied to the concha; besides the internal administration of Plummer's pills and sarsaparilla. By persisting in this treatment for upward of two months, the condylomata disappeared, leaving the meatus natural, when the membr. tymp. was found unimpaired, and the hearing was restored."

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[*] Pract. Obs. on Aural Surgery. Philadelphia reprint, 1853, page 202.

This case is so well described that I have quoted it almost completely. Wilde mentions cold, not syphilis, as the cause. The patient "is otherwise healthy, and attributes her affection to cold." Nevertheless he treats her with Plummer's pills and sarsaparilla, and I am inclined to think that the condylomata in this case were of syphilitic origin.

The majority of modern text-books on aural surgery mention either nothing or very little of the disease under consideration. Von Tröltsch says*: "Broad wet condylomata have repeatedly been met with in the external meatus of persons suffering from constitutional syphilis. The irritating secretion from them gradually produces different forms of inflammation and suppuration in the whole meatus."

A. Stöhr published in 1870, a paper† on the formation of broad condylomata in the external meatus. As resident assistant physician to the large hospital at Würzburg, he observed fourteen cases of broad condylomata in the ear canals of syphilitic patients, eleven of which were females. The disease occurred mostly on one side only, and in persons whose ear canals were narrow. It began in the depth of the meatus as red patches which developed into slight elevations (papulæ) and well marked condylomata. Their surface in most cases is exulcerated, and secretes a watery or a thin purulent discharge. They fill up the calibre of the ear canal, and in their growth may protrude beyond the external aperture. In one case only the condylomata occupied the edge of the outer orifice of the meatus. Pointed excresences are rare. The hearing was always impaired. The pain was moderate in most cases, in two only it was violent for a few days. Complications with severe affections of the middle ear, and rupture of the drum membrane are not mentioned. The condylomata were cured in the course of one or several months. Relapses were noticed in three cases, together with relapses of other symptoms of syphilis, about six weeks after the apparent cure of the affection. All patients regained good hearing. Mild cases were cured by constitutional treatment alone, severe cases required local treatment additionally, namely, abscission of the prominent excrescences, cautious touching of the deeper ones with nitrate of silver in substance, and most careful cleansing with weak solution of acetate of zinc and hypermanganate of potash.

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* Lehrbuch v. Aufl. p. 103, 1873.

† Arch f. Ohrenh. v. p. 130--137.

In the case which came under my own notice, the disease was so marked in all its features that an account of it will not be devoid of interest.

Mrs. H. Sh., æt. 38 years, of New York, had an eruption on her head, and discharge from her left ear when she was 10 years old. She recovered from it and enjoyed good health and perfect hearing until six months ago, when she contracted syphilis. Four months ago an eruption broke out all over her body, her throat became sore, her hair fell, the lymphatic glands were swollen, she lost strength, and her complexion grew pale and sallow. When her throat began to trouble her, she had an earache every now and then, but could hear well. At the same time there appeared in both external auditory canals small reddish pimples which increased in size and number so that in about four weeks they filled the canals and protruded outward. There was moderate, thin discharge from the ears, and considerable impairment of hearing. The discharge ceased occasionally, and at those times the ears pained her. This condition remained essentially the same until she presented herself at the New York Ophthalmic and Aural Institute, on September 20, 1878, when I found *both ear canals completely filled, and the external orifice of both meatus and the adjacent parts of the conchæ occupied all around by reddish, wart-like excrescences resembling the syphilitic condylomatous growths so often seen at the anus.* Some of them were ulcerated at their apices, and discharged a thin, watery fluid. By pulling the auricles back, the calibre of the auditory canals slightly opened. There was no tenderness on pressure in the mastoid region, the hearing was moderately good ($h=\frac{1}{24}$; $v=\frac{20}{60}$).

A papulous syphilide covered the whole body, and was very marked on the forehead. In the soft palate there were ulcers with unclean bottom and raised uneven edges. The glands of the neck were swollen, and the patient was very pale and weak.

The syphilitic nature of the affection being evident, I ordered the patient to take 0.03 of calomel with 0.006 of opium, three times daily, besides twice daily an inunction of 4.00 of mercurial ointment successively into different parts of the body; further, a gargle of chlorate of potash. The ear was syringed from four to six times daily with lukewarm water, after which the meatus was carefully wiped and dried, and calomel powder dusted on the excrescences. A part of the excrescences at the orifice of the right meatus was cut away with the scissors. No reaction followed, but the remainder of the ear canal recovered as well and almost in the same time as the part from which the excrescences had been removed. Under the above treatment the excrescences grew steadily smaller, and in the course of two months disappeared, leaving no trace. During the first weeks of the treatment, however, there was an aggravation of the affection in the pharynx. She suffered intense pain in her ears, and was relieved when profuse purulent discharge from both ears set in. The walls of the ear canals were so much swollen that no speculum could be introduced, yet the characteristic whistling sound on inflation showed that both drumheads were broken. The ears were inflated every day or every other day, and the former local treatment was continued. The general treatment, however, had to be discontinued for a short time, on account of mild salivation. The purulent discharge lasted about four weeks, at the end of which the excrescences and the swelling of the walls of the canals had been so much reduced that the bottom of the meatus could be examined with a speculum. The lower parts of both drumheads were perforated, the upper parts whitish, moist and swollen, —purulent infiltration.

From that time there was a regular progress in the improvement of the patient. The swelling and congestion of the pharynx diminished, the raised edges of the ulcers flattened down, their bottom cleared up, and the whole affection of the pharynx disappeared in the course of three months, without leaving any traces. The whitish discoloration of the softened drumhead was replaced by a dull red color. The thickened membrane was evenly stretched across the canal, showing a hole below the umbo, with sharp edges. The depth of the drum cavity was restored, its mucous membrane red, but not appreciably swollen. There was no otorrhœa. The adjacent parts of the ear canal were still red and slightly swollen ; the condylomata had all disappeared. The holes in the drumhead grew steadily smaller, and closed in about two months after the perforation.

When I examined the patient for the last time, February 20, 1879, her pharynx was completely cured, both ear-canals were clean and normal in every respect ; the drum membranes were entire, whitish, their details well expressed ; the reflexes dull. The hearing power for noises was still diminished ; that for speech fully restored, namely :

$h\ R=\frac{3}{24}''$, $L=\frac{6}{24}''$

Politzer's acoumeter $R\ 3'$, $L\ 4'$.

$=\frac{20}{20}'$, on both sides.

Bone conduction normal.

The general health of the patient was improving, and the mercurials were replaced by tonics.

From the whole history of the disease, it seems to follow that the extensive manifestations of secondary syphilis in different parts of the body were accompanied throughout the extent of both ear canals by the eruption of papulæ, which ulcerated (broad condylomata) and secreted a thin fluid. On the aperture of the canal and the adjacent part of the concha, the growth of the papulæ was interfered with neither by mutual compression nor by the secretion, which, running down the ear, left the margin, except on the lower part, dry and clean, and in a favorable condition for the unimpeded development of the condylomatous excrescences. In this manner the outer end of each ear canal surrounded itself with a wall of dry, spherical and conical, wart-like elevations, like a neckfrill.

The *ear disease* was, no doubt, a *serious* one. Apart from the peculiar affection of the outer ear, there was severe purulent inflammation of both middle ears, with perforation of the drumheads in a patient suffering severely from syphilis.

The complete recovery of the patient may serve as a precedent for forming a favorable *prognosis* in similar cases.

The *treatment* adopted in this case has answered the purpose, and seems appropriate. It consisted in mercurials, chlorate of potash gargles, cleansing of the ear by syringing, washing the meatus with a one per cent. solution of nitrate of silver, dusting the excrescences with calomel powder, and inflating the middle ear.

A CASE OF TUMOR OF THE AUDITORY NERVE OCCUPYING THE FOSSA FOR THE CEREBELLUM.

By GEO. T. STEVENS, M. D., of Albany, N. Y.

On December 27, 1878, Emma B. was brought to me by her physician with the view of having an operation for the relief of strabismus. The girl was seventeen years of age, of rather stout build and with thick dark skin. Her movements were heavy, her words dragged, and there was an evident want of intellectual activity. The eyes were affected by a very marked convergent squint, but I was informed by the Doctor that until she was about six years of age she had had divergent strabismus, and that several years ago the eyes began to turn inward. There was at the time of this interview a convergence of about five lines. Upon a more careful inspection of the organs, it was seen that there was paralysis of the external rectus muscle of each eye. The girl was able to carry the centre of the pupil of the right eye outward about two millimetres and the left about four millimetres beyond the median line. Her sight was found to be $\frac{20}{70}$ in each eye. The pupils were large and sluggish. Her hearing was lost in the left ear, and very imperfect in the right. Examined by the ophthalmoscope, both eyes exhibited the well marked choked disk which often characterizes inter-cranial pressure. There was moderate tumefaction of the disk which was distinctly striated, the veins of the retina were dilated and tortuous and the arteries attenuated. I learned that she was subject to headache in frontal and occipital region, and that at the present time there was a sense of unusual heaviness of the right arm and leg. The doctor also informed me that her friends had observed during the past four years there had been a diminution of mental activity, which they described by saying that she was "growing childish." Notwithstanding this she was an apt scholar, and regarded as a bright girl. Her memory was good; she had been able to maintain an excellent standing in her classes at school until she was fifteen, but in her fifteenth year had fallen behind her class, and had not been able to pass examination for the high school with her companions. I learned that at the age of thirteen or fourteen she ceased to mature, and her mind and habits reverted to the condition of childhood. She preferred the company of very young children, and enjoyed playing with dolls and other childish amusements. This liking for the amusements of early childhood had grown steadily upon her.

The deafness in the left ear had been known about a year, but upon close inquiry it seems probable that it had existed much longer.

Two years before her visit, her father had observed, when she was walking with him, that her gait was unsteady, and he had reproved her for it. Afterward her mother had noticed that she was unable to direct her steps upon a plank walk about three feet wide, but would go off on one or the other side; and a year ago a friend had laughed at her on account of her awkward gait. Her mother described it "as one would walk whose shoes were too tight." In walking through a door she would often come in contact with one side of it. She was able to work with her needle without difficulty up to the time of the examination,.and had recently executed some articles of fancy work, which she had done as actively and as dexterously as girls of her age and condition are wont to do.

Having learned the principal facts above related, I informed the Doctor that the case was not one for operative interference; that there was serious mischief at the base of the brain, and that the probable cause of trouble was a tumor at the base of its left hemisphere; and further, that should this diagnosis prove correct, the case had now assumed an active stage, and that an early termination in death might be expected. I however advised that the most favorable view of the case be adopted, and that he apply leeches to the neck, and take other active measures to subdue the meningitis which probably existed. My suggestions were accepted, but the girl rapidly lost strength. In three days after her visit to me she found great difficulty in walking or standing, especially as her right side seemed powerless.

On the fourth day she was no longer able to sit up, and took to her bed, which she was destined not to leave. She sunk gradually into a state of stupor, her speech becoming more and more hesitating and her intellect more clouded, until complete coma supervened, followed, a few hours later, by death, on January 26th, four weeks after the diagnosis and prognosis had been made, while she was in an apparent state of health, her condition having excited no unpleasant apprehensions on the part of her friends or her physician. During the last five days there had been total inability to move the right arm or leg, but no cramps or convulsions were present.

The *autopsy* twenty-two hours after death revealed, first the signs of recent and general meningitis, and on turning out the brain the suspected tumor was seen to occupy a large portion of the fossa for the cerebellum lying between it and the petrous portion of the temporal bone. The tumor occupied one half of the fossa, having crowded upon the cerebellum until the left hemisphere of that organ was but half the size of the other hemisphere. As the tumor was moved from its position it was seen that a cord or process from it was drawn from the very much enlarged opening representing the meatus auditorius internus, and that this thick cord or process evidently occupied the position of the auditory nerve. Other nervous bands attached to the surface of the tumor, were by its gravity broken before their course was determined. No other portion of the brain or cavity of the cranium exhibited any feature of interest except the signs of recent meningitis already mentioned. Only the tumor and a portion of the petrous bone were preserved. The latter at once attracts attention by the unusual size of the meatus auditorius internus. The tumor is in its general form nearly spherical but irregular and nodulated. Its diameter is about two inches and its weight one and a-half ounce. It has a dirty skin color, is firm to the touch and has upon its surface numerous vessels and nerves. A large cord or process on one side was drawn from the meatus auditorius internus, and is undoubtedly the remains of the auditory nerve.

If this supposition is correct the tumor is in or upon that nerve. A section through the tumor shows a firm solid mass, the cortical portion having a light gray color, while the inner portion is of a yellowish red. Microscopical examination shows the structure to be composed of fibrous and connective tissue with groups of spindle-shaped nucleated cells.

From the position in which the tumor was found, from the fact that the large cord which is seen on one side occupied the position of the auditory nerve in the meatus auditorius internus, and that almost directly opposite the cord is the broken extremity of another nervous cord less in size, and from the nature of the tumor itself we are justified in regarding the body as a sarcoma of the auditory nerve. This being the case, there are many points of interest connected with it.

First, independently of the variety of the tumor, it is a fact of much interest that such a growth should intrude upon the space allotted to the brain, and while crowding upon that organ during perhaps many years cause so little disturbance of the functions as that its presence should not be suspected. There were evidences in this case that the growth had existed for several years.

Another point of general interest is that while the patient is in apparently good health such a tumor may be suspected and even its location approximately determined, as was done in this instance. In respect to the nature of the tumor and its physiological bearings there are also points of much interest. The fact that notwithstanding the pressure upon the cerebellum which had caused a diminution of one half in size of one of its hemispheres, no defect of muscular coördination had been observed, except the circumstances of her unsteady gait, and her tendency to run against the side of a door when attempting to pass through. The first of these circumstances might possibly and the latter probably be accounted for by the paralysis of the ocular muscles. Another interesting fact is the entire absence, even to the last, of facial paralysis, which might be expected from the pressure upon the nerve of such a body, especially as the tumor followed the facial nerve into the meatus auditorius internus. The last circumstance seems to be accounted for by the fact that grooves upon the surface of the growth allowed the nerves to pass beneath it, secured against any unusual pressure.

Dr. H. Knapp, who examined the tumor with the microscope, described it as follows :

" The tumor, hardened in alcohol, is irregularly round and measures 45 *mm.* in length, 40 *mm.* in breath, and 36 *mm.* in depth. Its uneven surface is covered with a thin fibrous capsule which, when drawn off and placed under the microscope, exhibits a very dense network of delicate connective tissue fibres, interspersed with small round cells. The surface is traversed by numerous large and tortuous veins, and by many nerves which originate in an appendix or process of the tumor, pass in a radiating direction over its surface, and show no peculiar features either to the naked eye or under the microscope.

Immediately under the thin capsule of the pseudoplasm, there is a fibrous-looking tissue which can be torn off only in small irregular fragments, and under the microscope discovers a dense accumulation of regular spindle-shaped cells with longer or shorter offsets and distinct, oval, coarsely granulated nuclei. Sections passing through the tumor in different directions, show a dense fibrous structure throughout, with an irregular, rather fine striation. Microscopic specimens taken from all parts of the tumor, except from the vicinity of the above-mentioned appendix, show the same uniform structure as seen in the small pieces torn from the periphery of the tumor. The densely crowded fusiform cells are arranged in tracts which intersect one another at smaller or larger angles. Teazed preparations as well as very thin sections stained with carmine, logwood, and methylgreen, of which Dr. Born made a great many and very beautiful ones, demonstrated that the fibrous-looking tracts consisted exclusively of spindle-shaped cells. Many thin-walled well-filled blood-vessels pervaded the tumor, and extravasations of blood into its substance were seen here and there. Also a certain number of hyaline, colloid-looking corpuscles were, in some places, scattered through the tissue of the pseudoplasm.

The above described appendix or process of the tumor, which had entered the greatly dilated internal ear-canal, showed under the microscope the normal structure of a nerve. It was the acoustic. From it the nerve fibres could be followed a certain distance, 4 to 6 *mm.*, into the substance of the tumor. They were grouped in smaller or larger bundles which passed radiating between the tracts of the fusiform cells, among which they disappeared. I have not been able to see a larger portion of the nerve fibres pass like a cord on one side through the periphery of the tumor, nor have I detected any fibrous or myxomatous tissue in the pseudoplasm—conditions which are frequent in tumors of the optic nerve. The nerve fibres entered the growth in a radiating direction, were soon lost in it, and not collected again at the other end, as we commonly find in tumors of the optic nerve.

The result of the examination is that at the peripheral end of the acoustic nerve a large spindle-celled sarcoma developed the connection of which with the central end of the nerve could not be discovered.

I did not attempt to make a microscopic examination of the labyrinth, such as A. Böttcher and S. Moos have done in similar cases (ARCH. OPHTHAL. AND OTOL. iii. 1. page 134, and iv. 483), since for such an examination the specimen was not well enough preserved.

A NEW TEST FOR SIMULATED ONE-SIDED DEAFNESS.

By DAVID COGGIN, M.D., of Salem, Mass.

IN 1876 the writer was asked to testify in a medico-legal case, as to the presence of deafness in the plaintiff, a man of 42 years. Being alone at the time of examining him, it occurred to me that Camman's bin-aural stethoscope might be of help in the absence of the assistants necessary for the employment of Müller's and other ingenious tests for malingering. As the patient claimed to be deaf in his left ear, I inserted a tightly fitting wooden plug in the rubber tube that entered the right metal socket of the stethoscope, and then adjusted the two tubes to the sockets. On trying it I found I could not distinguish spoken words with my right ear. Asking the patient to put on the stethoscope, he readily repeated after me the words I whispered and spoke in the thoracic cup, which served as a mouthpiece.

The tube containing the plug was then removed, and the tragus was firmly pressed against the meatus so as to completely close it.

Then, on again speaking in the mouth-piece, the tube being applied to the left ear, as before, the patient positively denied that he could distinguish what I said to him. Of course he was aware that the tube through which he supposed he had heard before, was no longer in his right ear.

Believing this simple test for simulated one-sided deafness to be a new one, I venture to transmit it to the ARCHIVES, though not over confident as to its accuracy and utility.

June, 1879.

NOTE ON THE TREATMENT OF ACUTE SUPPURATION OF THE MIDDLE EAR.

By Dr. EDWARD T. ELY, New York.

THE tendency to spontaneous recovery, manifested by so many acute diseases, is observable also in acute suppuration of the middle ear. Probably this is not a new thought to any reader of this paper, but it seems to the writer to be too much ignored in practice. Great labor has been required to lead physicians and laymen to consider acute suppuration of the middle ear as of any importance. This work has involved much writing and discussion as to the nature of the disease, and as to the necessity for prompt and efficient treatment of it. It is natural that many practitioners, having thus been laboriously awakened to its importance, should hold exaggerated ideas as to the remedies required for its cure.

Notwithstanding the efforts which have been made to bring patients with acute aural disease under treatment, the majority of them continue to be neglected by themselves and by their family physicians. The numerous cases of acute suppuration of the middle ear which have recovered, and which are constantly recovering, in spite of neglect or of bad treatment, afford proof of a tendency to self-limitation in the disease. Every aurist sees many patients who, in stating their history, refer to former suppurations of the drum which have ceased spontaneously. The drumhead is found to be well healed, although it may present extensive cicatrices, and the hearing is either perfect or only slightly impaired. It cannot be denied that many of these patients have fared as well as if they had been under the most skilful management.

Admitting these facts, should they not influence our practice somewhat? It is not intended here to underrate the importance of having every case of this disease under the observation of a competent surgeon from the outset. Nor is it designed to make any argument against the greater part of the treatment usually employed, but simply against the use of astringents or caustics before they are certainly indicated. We are assuming that the pain and congestion of the first stage have been subdued and that we have to deal only with a perforated drumhead and a suppurating tympanic cavity. Under these circumstances, would it not be preferable, in every case, merely to keep the ear clean and to watch it for a few days, to see what it is disposed to do for itself, before resorting to any more active treatment? It will surprise a person who has never done this, to find how often the drumhead will heal and the disease be cured before this watching-process is finished. The application of an astringent or caustic is certainly needless in many instances. The use of them, moreover, has certain disadvantages. If, in such a condition as we are considering, the surgeon immediately applies them, he complicates the problem before him. If the ear does not happen to do well, he is at a loss to know how far this is due to the disease, how far to erroneous treatment. Any person who has treated a severe case of purulent ophthalmia, threatening destruction of the eye, knows how embarrassing our uncertainty as to the choice of remedies may become. If, on the contrary, a suppurating tympanic cavity has been watched long enough to determine its natural tendency, any needed remedy can be adapted to it with far more accuracy. The choice of even such mild remedies as our weakest solutions of zinc or alum is not a matter of indifference. We have all seen cases where they seemed to increase the swelling, or the discharge, or the loss of tissue. The following one seems to show a still more serious effect:

Miss H., aged 20, consulted me November 30, 1877, with acute suppuration of her left middle ear of ten days duration. There was a free discharge of pus, and no pain or swelling. I ordered syringing of the ear, and the instillation of a two grain solution of sulphate of zinc twice daily. Immediately after using the zinc drops she began to have violent pain in the ear. This pain continued all night, and, when I saw her the next day, the auditory canal was so swollen that the drum could not be seen; the whole of that side of the face was swollen and tender, and there was congestion and pain in the eyeball. There was a temperature of 101° and some vertigo. Leeches, hot water, morphine, and rest in bed were prescribed. The pain, swelling and vertigo did not disappear until the evening of December 4th. I always attributed this attack to the effect of the zinc, although I have no further proof of the fact than the patient's own belief of it, and the history of the case.

The following cases are offered in illustration of what has been said above. Only a few are given out of a larger number which might have been presented had it been thought essential to the argument:

I. Susie M., aged 6, came on November 11th with a history of pain in her left ear from six o'clock until eleven of the previous evening. The drumhead was found congested and ruptured, and there was a purulent discharge. Syringing of the ear with warm water twice a day was ordered. On the 14th there was no discharge, and the perforation seemed to be healing; the syringing was discontinued. On the 16th the perforation had healed and the hearing was fully restored.

II. Miss J. H., aged 21, came on March 11th, having had severe pain in her left ear since 3 A. M. The drumhead was found ruptured, and there was purulent discharge. The hearing on that side was $\frac{6}{40}$. Leeches and the hot douche were ordered, and they seemed to arrest the pain at once. After that, the ear was simply syringed occasionally with warm water. On the 13th the perforation was nearly closed. On the 18th it was completely healed, and the hearing was $\frac{40}{40}$.

III. Mrs. M., aged 35, came on March 17th, saying that she had had a cold in her head for the past week; that two or three days ago, while blowing her nose, she had felt a "cracking" in her right ear, and that since then there had been a discharge from the ear. [Before this trouble the drumhead on that side was cicatricial from a suppuration in childhood.] A large perforation was found in the posterior part of the drumhead, with a muco-purulent discharge. The hearing was $\frac{6}{40}$. Syringing with warm water, two or three times a day, was ordered. On March 19th the perforation was much smaller; the discharge was still abundant. On March 20th there was no discharge. The next day her cold became worse, and she had some fever. The following three days she had throbbing and tinnitus in the right ear with reappearance of the discharge; also had some vertigo. Was taking quinine during this time. On the 25th the discharge had ceased, and a few days later the perforation was healed. Hearing $\frac{6}{40}$.

IV. Mr. W., aged 40, came on February 24th with a broken drumhead and acute suppuration in the right middle ear. The discharge had appeared on the 19th, after eight hours of pain in the ear. Syringing with warm water was prescribed. On February 27th the discharge was found to be less. On March 2d the discharge had ceased and the perforation was very small. A few days later the drumhead was found to be healed and the hearing restored.

V. Master L., aged 5, came June 17th with a history of earaches, both sides, for the previous four weeks. An examination showed perforation of both drumheads and acute suppuration of the middle ears. No treatment was employed except syringing with warm water. The patient made a perfect recovery.

VI. Master F., aged 14, came on April 7th with acute suppuration of the left middle ear. The use of the warm douche was prescribed. On April 17th the ear was doing well, and the hearing was $\frac{12}{40}$. A few days after this the patient was cured.

In this case and the preceding one the exact date of recovery was unfortunately not recorded.

VII. Miss M., aged 18, came on December 14th with acute suppuration of the right middle ear, of a few days' duration. She had already had a chronic suppuration of that ear, following measles, which had been checked, without restoration of the drumhead. Warm syringing was prescribed. On January 11th the discharge was found to have ceased.

VIII. Master V., aged 16, came on June 20th with an acute suppuration of the left middle ear. The discharge, which was very bloody, had been noticed by the patient a day or two previously, after a night of very severe pain in the ear. There had already been marked deafness on both sides, from chronic catarrh, for many years. The only treatment prescribed was syringing of the ear with warm water two or three times a day. On June 27th the drumhead was found to be healed. There had been no discharge for several days.

The cases given above are thought to be sufficient in number and variety for the purposes of this paper. The local treatment in all consisted simply in syringing the ear with warm water as often as seemed advisable. Of course the throat and the general health received attention when it seemed needed. It is believed by the writer that treatment as simple as this is sufficient for many cases of acute suppuration of the middle ear, and that it is usually well to make a trial of it for a few days before resorting to anything more energetic.

Several of the cases here presented are from the practice of Dr. D. B. St. John Roosa, to whom I am indebted for the use of them.

ABSTRACT OF AMERICAN OTOLOGICAL LITERATURE FOR THE FIRST QUARTER OF 1879.*

By SWAN M. BURNETT, Washington, D. C.

1. Perforating wounds and injuries of the membrana tympani. Dr. C. S. Turnbull. Reported by Dr. C. E. Sajous, Med. and Surg. Reporter, Philadelphia, Feb. 22d.

In this paper there are the reports of three cases :

Case I.—*Traumatic perforation of the membrana tympani, with fracture of the handle of the malleus.*

A teamster aged 19, had a pen-handle thrust in the ear by a mischievous boy. This was followed by slight hemorrhage, a little pain and some dizziness. An apothecary instilled some nitrate of silver which was followed by inflammation which extended to the drum cavity. *M. T.* macerated so that no details could be made out. Treated by instillations of warm solutions of salt and water and the use of Politzer's bag tri-weekly, and Tr. Iodine over mastoid. On subsidence of the inflammation, the handle of the malleus was found to be broken a short distance from the umbo. The fracture united, but not in proper opposition, the lower end riding over the upper portion of the handle. There were two triangular light spots, one from the umbo, the other from the broken end of the malleus handle.

Case II.—*Perforation from a thrust of a pencil.*

In a fortnight healed with normal hearing power.

Case III.—*Foreign body* (*bug*) *removed from the ear after having remained three years.*

A large bug crept into the ear of a man aged 52, on a summer night. Great pain and distress until the wife poured oil in and drowned the bug. Six months after, increasing deafness and tinnitus, which continued until seen by Dr. T., who removed by syringing a well-preserved coleopteran with its mandibles fixed in the dermoid layer of the *M. T.* which came away as an exfoliation.

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* This abstract is made from general medical journals only. The papers of the special journals—Transactions Am. Otol. Soc., and Amer. Jour. of Otol.,—will be reviewed in the systematic reports.—Editors.

2. *A case of mastoid disease. Chas. P. Knapp. Philadelphia Med. Times, Feb.* 15*th.*

A woman 23 years of age, had more or less earache since September, 1877. In June, 1878, there was perforation of the drumhead ; ordered a blister over the mastoid. On July 4th there was a purulent discharge from the ear and pain and swelling over the mastoid. Perforation of the mastoid cells was resorted to, and ʒ ji of pus evacuated. Bone found denuded of periosteum and soft. Wound closed and had to be reopened, but a successsul result was finally obtained. Watch heard at 8 inches.

3. *Fibroid tumor of the ear. Robt. C. Finley, M. D., Philadelphia Med. Times, Feb. 1*, 1879.

A colored girl of 12, had a tumor on the lobe of each ear standing out at right angles from the posterior surface. One was 1¼ inches in length, ½ inch at its base and ⅜ inches at its free end ; the other smaller. Ears pierced three years before. Removed.

4. *A modification of Wilde-Blake's Aural polypus snare by Dr. C. H. Burnett, Philadelphia Med. Times, Jan.* 15*th.*

Dr. Burnett's modification of Dr. Blake's modification of Wilde's snare is to have the canula through which the wires pass much reduced in size, its outside measurement being only 1 *mm.* It is made of steel, but he suggested that it might be made of virgin silver. The wire for use in this small canula must of course be very fine, and he has found fine brass piano-wire very satisfactory.

5. *Fistulous caries of the mastoid complicated with temporal subperiosteal abscess and cranial abscess.—Cure.—N. J. Martinache, M.D. —Western Lancet, March.*

A man, 55 years of age, of strong constitution, saw Dr. M. on August 10, 1877. Fourteen months before he had purulent inflammation of the left ear. When Dr. M. saw him he was still suffering from this purulent inflammation ; there was a perforation of the *M. T.*, mastoid red and swollen. There was a fistulous opening in the latter through which a probe passed from below, forward and inward for two inches. Pus escaped through the auditory canal more abundantly than through the opening. This fistula was first enlarged by means of a gouge and afterwards by a trephine, but with no improvement. On December 20th, a temporal subperiosteal abscess formed, which was opened. On January 20th, violent pains in head and occasional vertigo. It was then determined to remove all the diseased bone, and for this purpose a vertical incision was made 3½ inches in length, reaching from the upper level of the concha to the apex of the mastoid. All the diseased bone was then removed, leaving a cavity 2¼ inches by ½ inch wide, and ⅕ to ⅗ inches deep. Before this a probe had been passed through the carious wall of the skull against the dura mater, pressure on which lowered the pulse-beat one-half. At the fifth week the wound had filled up with granulations, and in the seventh week cicatrization was complete. He remains deaf on that side.

6. *Otitis media purulenta chronica, followed by necrosis of temporal, occipital and parietal bones, with meningitis and abscess of the cerebellum.—W. Oliver Morse, N. Y. Med. and Surg. Brief, February.*

The history of the case is such as we usually find in similar ones ; chronic discharge—final involvement of the mastoid cells—necrosis—meningitis—death. In this case the mastoid was freely opened and there was much discharge of fetid pus. On autopsy there was found extensive necrosis extending from the parieto-occipital to the temporo-parietal suture. In this last an opening was found leading into the cavity of the skull, on a level with the lateral sinus ; probe passed through the opening entered the sinus. Meninges congested—dura mater adherent to posterior third of longitudinal sinus. In the centre of the right lobe of cerebellum, an abscess the size of a walnut.

7. *Acute inflammation of the middle ear in some of its anatomical relations.—J. S. Prout, M. D.—The Hospital Gazette, N. Y., March*, 1879.

In this paper Dr. P. sets forth the relation of the anatomy of the middle ear to the surrounding important parts, brain, blood-vessels, etc., and dwells on the danger of the "let alone" policy in the treatment of acute catarrhal inflammation of the drum cavity. He believes in a puncture of the drum membrane in these cases, as soon as the accumulation of fluid is so marked as to lead to a bulging of the membrane. Four cases are given in illustration of his views.

8. *Persistent tinnitus aurium, followed by symptoms of cerebral embolism, successfully treated by ligature of the post. occip. artery. Robt. Reyburn, National Med. Review, Jan.*, 1879.

A man, 64 years of age, had first an attack of acute inflammation of the internal (?) ear on the left side. He was treated for this in the usual manner. Hearing power fully regained, but a most frightful tinnitus succeeded. The "drumming" was confined to the left side and was synchronous with the pulse, and increased by anything that accelerated the action of the heart. Was treated for fifteen months with various arterial sedatives, but with no effect, except in the single case of the hydrobromic acid, which, when given in 10 minim doses every three hours, afforded some relief to the tinnitus. The patient himself discovered accidentally that, by applying a pad over the posterior occipital artery and making pressure sufficient to stop its pulsations, the tinnitus disappeared.

On examination a cirsoid aneurism was found in the course of the post. occipital artery, with the characteristic thrill and bruit. A ligature was applied to the vessel, just over the groove in the mastoid process, and the tinnitus was permanently relieved.

9. *Coffee-bean from ext. aud. meatus.—Dr. J. Solis Cohen, Trans. Pathol. Soc., Philadelphia, vol. vii.*

The bean had remained in the meatus for fifteen years, with no inconvenience except impaired hearing, greater in damp weather, and slight neuralgic pains. After removal by the curette hearing became normal.

10. *Otitis media purulenta, mastoiditis and pyæmia.—Dr. A. S. Reynolds, Trans. Pathol. Soc., Philadelphia, vol. vii.*

The patient had acute inflammation of the middle ear of right side, implicating the mastoid, for two weeks. Mastoid perforated by Dr. Burnett, after which the patient improved as far as the ear trouble was concerned, and was about to be discharged from the hospital when he was taken with all the symptoms of pyæmia, from which he died. As all the vessels and sinuses about the diseased part were found in a healthy condition, there is some obscurity as to the manner in which the septic matter got into the circulation.

11. *Foreign bodies in ear and nose.—A. Couvert, M.D., Atlanta Med: and Surg. Jour., Mar.*

Relates one case where, after unsuccessful attempts to remove a foreign body (a shot) by means of the scoop, it was caused to fall out by turning the head over to that side and jarring it with the hand.

12. *Foreign body in the ear.—W. D. Hunt, Southern Med. Record, Jan.*

A pea remained in the external auditory meatus for two years without causing pain. When removed it showed no signs of germination.

REPORT ON THE PROGRESS OF OTOLOGY

IN THE FIRST HALF OF THE YEAR, 1878.

(*Continued from page* 111.)

IV. PATHOLOGY AND THERAPEUTICS OF THE ORGAN OF HEARING.

By A. HARTMANN, of Berlin.

Traslated by Isidor Furst, of New York.

General.

1. Weber-Liel: Die Anwendung der Kälte bei acuten Affectionen des Ohres. [The Application of Cold in Acute Affections of the Ear.] *Monatsschrift für Ohrenheilkunde*, etc., No. 1, 1878.
2. E. Woakes: Noises in the Head; their Etiology, Diagnosis, and Treatment. *The Lancet*, Feb., 1878.
3. E. Woakes: The Connection between Stomachic and Labyrinthine Vertigo. *Brit. Med. Journ.*, March, 1878.
4. Dr. W. Poorten: Ein Fall von objectiv wahrnehmbaren Ohrgeräuschen. [A Case of objectively perceptible Noises in the Ear.] (Riga.) *Monatsschrift für Ohrenheilkunde*, etc., No. 4, 1878.
5. Dr. Weil (of Stuttgart): Reflexwirkung im Gebiete des Gehörorgans. [Reflex action in the Region of the Organ of Hearing.] *Monatsschrift für Ohrenheilkunde*, etc., No. 6, 1878.
6. R. Voltolini; Otalgia intermittens. *Monatsschrift für Ohrenheilkunde*, etc., No. 5, 1878.
7. Weber-Liel: Ueber fragmentäre, larvirte Formen des Wechselfiebers im Gebiete des Gehörorgans; Malarianeuralgieen im Gebiete des Trigeminus und der andern das Ohr versorgenden Nerven. [On fragmentary, masked Forms of Intermittent Fever in the Region of the Organ of Hearing; Malarial Neuralgias in the Region of the Trigeminus and the other Nerves supplying the Ear.] *Monatsschrift für Ohrenheilkunde*, No. 5, 1878.

8. James Patterson-Cassels: Sewer-Gas and Ear Disease: a Record of Struggles with foul Drains and other Insanitary Conditions. *Edinb. Med. Journal*, April, 1878.

9. Dieulafoy: Des troubles auditifs de la maladie de Bright. [Auditory Disturbances in Bright's Disease.] *Gazette hebdom.*, No. 4, 1878.

10. Dr. Guerder (Longwy): L'otologie dans les dix dernières années. [Otology in the last ten years.] *Annales des maladies de l'oreille*, etc., tome iv, No. 1.

11. J. J. Kirk-Duncanson: Report of One Hundred Cases of Diseases of the Ear. *Edinburgh Med. Journ.*, March, 1878.

12. J. Patterson-Cassels: Thoughts and Suggestions concerning the Education of Deaf Children. *Edinburgh Med. Journ.*, Feb., 1878.

13. Prof. Emilio de Rossi: Relazione sopra l'Ospizio dei Sordo-Muti di Roma. [Report on the Hospital for Deaf-Mutes at Rome.] *Estratto dagli Atti dell' Academia Med. di Roma*, anno IV, fasc. 2.

14. Dr. Hedinger (of Stuttgart): Eine neue Batterie für Galvanokaustik. [A new Battery for Galvano-Caustics.] *Deutsche Med. Wochenschrift*, No. 22, 1878.

15. Prof. D. Voltolini (of Breslau): Eine neue galvanische Batterie und neue galvanokaustische Instruments. [A new Galvanic Battery and new Galvano-Caustic Instruments.] *Deutsche Zeitschrift für pract. Medicin*, No. 22, 1878.

1. In acute inflammations of the external auditory meatus, Weber-Liel applies cold compresses to the ear in conjunction with the alcoholic ear-baths recommended by him, and reports favorable results. He most ardently advocates these compresses in the acute inflammation of the middle ear, for moderating the pain and reducing the hyperæmia. This treatment does not appear appropriate in simultaneous violent inflammation of the naso-pharyngeal space, while it could not be replaced by any other therapeusis, in the author's opinion, in the idiopathic and traumatic, respectively artificial, form of inflammation. By cold applications Weber-Liel understands Priessnitz's compresses, to be changed at first every half-hour, later every one or two hours. According to the experience of other authors, agreeing with that of the Reviewer, ice applications are productive of the best results in just the above-mentioned forms of acute inflammation of the middle ear.

2. Woakes attempts to surmount the difficulties hitherto encountered in the classification of the different noises in the ear, by making them dependent upon various pathological conditions in the ear. Woakes starts with the view that every noise perceived must have an objective real cause. Therefore, no regard is had to the physiological experience that sensory perceptions may also be produced by heterologous excitations, and that exciting causes, both in its terminal apparatus and in its course, may arouse its specific energy. Despite the uncertainty underlying Woakes' labors in this assumption, his deductions offer many suggestions of interest, and will lead to further investigations. Pulsating noises are evoked by arterial congestion, as a cause of which he considers mainly the disturbance of innervation by the sympathicus colli (comp. 3). Continuous noises result from venous hyperæmia, from circulatory derangements of the blood. In one case these noises disappeared under the application of Carlsbad salt. The pulsating noises appearing in anæmia and aneurisms are also objectively perceptible, and take their origin outside the organ of hearing. The intermittent boiling, bubbling noises are said to be caused by ingress and egress of air during accumulations of secretions in the Eustachian tube and the tympanic cavity, and may be removed by appropriate treatment.

3. Woakes emphasizes the fact that the labyrinth receives its blood-supply through the arteria vertebralis, and hence that constrictions and dilatations of this vessel, dependent upon the inferior ganglion of the sympathicus colli, must make themselves felt in the labyrinth. In defective innervation a hyperæmia occurs in the region supplied by the artery, causing pulsating noises in the labyrinth and vertigo. Inasmuch as the lower cervical ganglion is in connection with the vagus and the plexus brachialis, the relations between symptoms referable to the labyrinth and those of the stomach, heart, and upper extremity, may be demonstrated. A shock received may extend its effects from one of these regions also to the others. This is the author's explanation of labyrinthine and stomachic vertigo. Hyperæmia of the labyrinth is often produced, in the author's opinion, by disturbances of innervation from the lower cervical ganglion. Tobacco and quinia act as checks, hydrobromic acid as an excitant, upon the innervation. The author abserved good effects from the latter remedy in tinnitus and vertigo.

4. In a female patient, æt. 45, troubled with nervous affections,

there occurred, subsequent to a trauma, beating in the left orbit, headache, and in the left ear a loud noise resembling the roaring of the ocean. At the distance of eight inches from the ear, and particularly by auscultation of the skull, a loud, blowing noise was perceptible which, on closer investigation, proved to be a systolic murmur isochronous with the pulse-beat. Compression of the carotid did not cause its disappearance. Poorten collects three similar cases from otological literature known to him, and calls attention to the relatively frequently observed, objectively perceptible noises in traumatic injuries of the eye caused by aneurisms of the orbit. In Poorten's case likewise a plainly visible prominence (6 *mm.*) of the left globe soon occurred.

5. Weil observed, in isolated cases, remission of subjective auditory sensations produced by intermittent injections of air against the walls of the external ear-canal.

6. The case reported by Voltolini concerned a boy of ten years of age, who had for some considerable time complained of pains in the ear which increased in severity and particularly occurred at night. Impairment of hearing. Aside from a somewhat reddened membrana tympani, nothing abnormal was found; improvement of hearing by the air-douche. Leeches, ice applications, and chloroform proved unavailing, until Voltolini finally suspected an intermittens larvata from the severity of the intermitting pains. After the exhibition of quinia, 0.05 grm. every hour, the pain disappeared in the first night, and did not recur under the continuance of the remedy.

7. In connection with the preceding publication of Voltolini, Weber-Liel claims priority regarding the first communication of an intermittent occurrence of ear-affections caused by malarial infection. According to Weber-Liel, otitis intermittens is said to occur in conjunction with angina and naso-pharyngeal catarrh, with pain, fever, impairment of hearing, and subjective noises; early occurrence of exudation into the tympanic cavity. Cessation of pain during the day. Weber-Liel believes that many forms of impaired hearing should be attributed to malarial infection. After a longer persistence of the affection and subsequent local metamorphoses, quinia treatment proves unavailing. The author mentions a case in which loud auditory noises, occurring with nightly exacerbation and impairment of hearing, after an existence of several months, were cured in a short time by the exhibition of quinia.

8. Patterson-Cassels describes observations made upon members of his own family as to how the admixture of a small quantity of sewer-gas to the atmosphere may give rise to general indisposition and to serious affections of the ear. Of the five children of the author, four fell ill within a short time of acute inflammation of the middle ear, in three with violent, acute symptoms which could be easily mastered by the treatment adopted—paracentesis membranæ tympani. In the fourth child he discovered, a few days subsequently, an almost complete deafness consequent upon a painless catarrh of the middle ear, which yielded only to prolonged treatment and after repeated incisions of both membranæ tympani. A minute investigation of the sanitary condition of the dwelling disclosed the fact that sewer-gas from two water-closets could escape into the house, and the cess-pool had not been emptied for two years.

In connection with the occurrence of inflammation of the middle ear observed in his own dwelling, the author reports a series of similar observations tending to prove that unwholesome sanitary conditions—particularly defective drainage and stagnation of sewer products—may give rise to ear affections curable either by removal of the cause or by transferring the patients into a better atmosphere.

9. Dieulafoy reports that since he directed his attention to the auditory disturbances occurring in the various forms of Bright's disease, he found them by no means rare, but that they should be taken into consideration just as well as the ocular disturbances. At times only subjective noises, at times impairment of hearing, sometimes both symptoms are present, either in one or both ears. Deafness is rare ; at times there is violent pain in the face and the ears. The disturbances of hearing may occur in all forms and stages of the nephritis. Regarding the pathological alterations on which the auditory disturbances are based, Dieulafoy offers only conjectures. In reference to diagnosis Dieulafoy thinks that, where there are disturbances of hearing accompanying cardiac symptoms or such as indicate uræmia, we ought to examine the urine.

10. In his discussion of the otology in the last ten years, Guerder in his first section reports fully on anterior and posterior rhinoscopy. The second section treats of the "subjective examination of the ear," wherein he discusses the importance of the air-douche as a means of diagnosis, and the auscultation in sound conduc-

tion through the bones of the skull. The purely objective and reserved position the author assumes in diagnostic valuation of auscultation is pleasing, inasmuch as he arrives at the conclusion that the auscultation of the ear has, to a certain degree, disappointed our expectations. Guerder expresses himself with the same reserve regarding ausculation in sound conduction through the bones of the skull, and as to the entotic application of the ear-trumpet after Bing.

11. Among the one hundred cases, reported by Kirk-Duncanson, a malignant neoplasm, at first considered as a mucous polypus, is noteworthy. During five years a swelling in the external auditory meatus had repeatedly occurred, and had been excised until it finally assumed a malignant character, rapidly proliferating and causing death after very violent pains.

In speaking of four deaf-mutes coming under observation, the author not unjustly expresses his surprise at there being no further opportunity for the instruction of deaf-mutes after the German method in Edinburgh, where formerly, under Braidwood, the instruction of deaf-mutes in articulate language flourished.

12. After fully discussing the condition under which the development of speech takes place, and the deleterious effect the loss of hearing and speech has on the intellectual growth of the child, Patterson-Cassels calls attention to the importance for deaf-mutes of acquiring speech, and advises his countrymen to abandon the language of signs in the instruction of deaf-mutes, and to introduce the German method, teaching articulate speech. The reviewer begs to add that the German method, according to which some English institutions likewise teach, could be advantageously introduced mainly where there is an ample staff of teachers and the course of instruction can be extended to a duration of six to eight years.

13. De Rossi, in his extensive work (forty-four pages), gives a report of his examination made at the Deaf-Mute Institute at Rome. The results obtained by Rossi respecting the hearing capacity of deaf-mutes and the morbid processes underlying deaf-mutism differ in many particulars from views hitherto prevailing. A comprehensive historical discussion of the development of deaf-mute instruction follows. At the conclusion he dilates on the need of accurate statistical information to be furnished by physicians. Further, that it is the physician's business to decide whether treatment of the organ of hearing should be instituted or

not. Besides, the physician is to determine whether the deaf-mute should be instructed by the finger alphabet or in articulate speech. The latter task is unnecessary in Germany, where articulate speech alone is taught.

14. The galvano-caustic battery described by Hedinger consists of six large zinc-carbon elements immersed in Bunsen's mixture of potassa bichromate with sulphuric acid, and provided with submersion and lifting apparatus ; it is accompanied by a galvano meter, commutator and regulator. The battery requires little attention, as the fluid needs changing but rarely. The easily regulated current of constant strength is extolled. The price of the apparatus, with all attachments is 250 marks at the manufacturer's, Baur in Stuttgart ; four elements, with simple lifting and immersion device, 80 marks.

15. Of similar construction, likewise consisting of zinc-carbon elements and filled with Bunsen's fluid, is the apparatus described by Voltolini, which is manufactured in three different sizes by Brade, in Breslau. The small apparatus at 45 marks is said by Voltolini to be sufficient for all galvano-caustic operations. Compared with Middledorpf's battery, its lesser constancy in effect is emphasized to its disadvantage, while it exceeds the latter in intensity of glowing power.

External Ear.

16. PROF. J. GRUBER (of Vienna) : Ueber die Wirkung der medicamentösen Gelatin-Preparate bei Otitis Externa. [On the Effects of Medicated Gelatine Preparations in Otitis Externa.] *Monatsschrift für Ohrenheilkunde*, etc., No. 2, 1878.

17. PROF. DR. MOOS (of Heidelberg) : Ein Fall von Ambohrung des in Folge von Entzündung knöchern verschlossenen äusseren Gehörganges. [A case of Perforation of the External Auditory Meatus Closed by Osseous Tissue in Consequence of Inflammation.] Virchow's *Archiv*, Bd. lxxiii, 1878.

18. G. FIELD : On the Etiology of Aural Exostoses, osseous Tumors following Extraction of Polypus. *Brit. Med. Journ.*, Feb. 2, 1878.

19. DR. JACUBASCH (Military Surgeon of Berlin) : Bruch des knöchernen Gehörganges in Folge eines Hufschlages. [Fracture of the Osseous Auditory Meatus in Consequence of a Kick by a Horse.] *Berl. Klin. Wochenschrift*, No. 22, 1878.

20. R. Voltolini. Ueber das Offenhalten einer künstlichen Oeffnung in Trommelfelle und die ringförmige Canüle. [On Keeping an Artificial Opening in the Membrana Tympani Patulous, and the Ring-shaped Canula]. *Monatschrift für Ohrenheilkunde*, etc., No. 1, 1878.

16. Favorable experiences with medicated gelatine preparations in otitis externa causes Gruber to publish them, the more "as they might be of equally great advantage to the patients and the practising physicians, if further observations should confirm them." The gelatine preparations are made with morphia and the aqueous extract of opium in the proportion of one to ten. The medicated substance is introduced into the external auditory meatus which is then closed with cotton, once or twice daily.

17. Moos recapitulates, from the literature known to him, all cases of osseous closure of the external auditory meatus treated operatively, and lays stress on the fact that in all these cases the closure dated from a slow growth of exostoses. In a case observed by the author, the osseous closure formed with comparative quickness, and consequent upon a general hyperostosis of the walls of the external meatus. After the occurrence of an acute purulent inflammation of the right external meatus, lasting fourteen weeks, an osseous closure of the external auditory meatus, about 7 *mm.* in depth, supervened in the course of the following months. Deafness. Perforation of the occluding osseous mass by a drill. Relative restoration of the hearing power.

Noteworthy is the result of auscultation after insertion of the catheter, inasmuch as a loud, blowing noise was perceptible, just as after medium-sized perforations. Moos concluded from this result of auscultation that the depth of the osseous mass occluding the external auditory canal was of small extent, which was not verified during the operation. Moos explains this deception by the results of Michael's experiments on the auscultation of the mastoid process, for which the reader is referred to the original.

18. Field observed, a few months after the removal of a polypus in a girl three years of age, a small osseous tumor, the size of a pea, in the external auditory meatus, nearly filling it. Field considers as a more dangerous form of osseous new-formation in the external auditory meatus the bone-proliferation of the consistence of ivory arising entirely independent of inflammation, running a symptomless course, and becoming first perceptible by impaired hearing. In one patient, Field perforated a thick ivory-like mass,

completely filling both external auditory meatus, with a drill.

19. A soldier was kicked on the chin by a horse, in consequence of which there was hemorrhage from both ears. No cerebral symptoms. Shortly after there was swelling in both external auditory meatus, as well as in the region of both maxillary joints. Hearing normal after the removal of the blood coagula. A small splinter of bone on one side was perforating the skin of the external auditory meatus. Jacubasch thinks that for the production of a fracture the effective force must strike the lower maxillary bone in its longitudinal axis.

20. As the ring-shaped canula formerly recommended by Voltolini for insertion in the membrana tympani did not satisfy the expectations, Voltolini returns to the small tubes already used by earlier aurists for the same purpose. [Compare, *e. g.*, Frank's Handbuch, 1845, p. 310.—REV.] They are to maintain their position by resting upon the floor of the tympanic cavity and the external meatus. The tubules employed by Voltolini contain, besides the terminal apertures, lateral openings, to serve in case the former become occluded.

Middle Ear.

21. PROF. E. ZAUFAL. Beitrag zur Typanoskopie. [Contributions to Tympanoscopy.] *Prager Medical Wochenschrift*, No. 13, 1878.

22. PROF. J. GRUBER, (of Vienna.) Zur Behandlung des Ohrenflusses. [On the Treatment of Otorrhœa.] *Algem. Wiener Med. Zeitschrift*, No. 1, 1878.

23. DR. HARTMANN, (of Berlin): Mittheilung über einen Fall von Erweichung der Gehörknöchelchen. [A Case of Softening of the Ossicles of Hearing.] *Archiv f. Ohrenheilkde.*, Bd. xiii., p. 259.

24. DR. J. PATTERSEN-CASSELS. On the Local Use of Iodoform in Ear Disease. *Brit. Med. Journ.*, March 2, 1878.

25. DR. C. MIOT. De la ténotomie du muscle tenseur du tympan. [On Tenotomy of the Tensor Tympani Muscle.] *Le Progrès médical*, Nos. 9, 11, 13 and 14, 1878.

26. DR. SCHWABACH, (of Berlin): Mystagmusartige Augenbewegungen in Folge eines Ohrenleidens. [Nystagmus-like Motions of the Eye in Consequence of an Affection of the Ear.] *Deutsche Zeitschrift für pract. Med.*, No. 11, 1878.

27. Ménière. Observation de délire consécutif à une otorrhée purulente chronique. [Observation of Delirium in consequence of Chronic Purulent Otorrhœa.] *Gazette des hôpitaux*, No. 19, 1878.

28. Dr. L. Blau, (of Berlin): Ein Fall von klonischem Krampf des Musc. tensor tympani ohne subjective Empfindung. [A Case of Clonic Spasm of the Tensor Tympani Muscle without Subjective Sensations.] *Archiv für Ohrenheilkunde*, Bd. xiii, p. 261.

29. H. Schwartze. Casuistik zur chirurgischen Eröffnung des Warzenfortsatzes. [Case of Surgical Opening of the Mastoid Process.] *Archiv fur Ohrenheilkunde*, Bd. xiii, p. 245.

30. Dr. Levi. Note sur un nouveau procédé de cathétérisme de la trompe d'Eustache. [Note on a new manner of Catheterization of the Eustachian Tube.] *Annales de maladies de l'oreille, etc.*, tome iv, No. 1.

21. Zaufal reports attempts at examination of the tympanic cavity by means of small mirrors introduced therein. He employs for the purpose small concave mirrors of steel fastened to a flexible wire. In one case Zaufal succeeded in detecting, by means of such a mirror, the attachment of a polypus at the posterior wall of the tympanic cavity—the cause of an otorrhœa hitherto unsuccessfully treated—and in removing it.

22. In otorrhœas caused by morbid processes in the external auditory meatus, especially circumscribed swellings, Gruber applies pledgets of cotton or bougies of laminaria digitata, which are covered with medicated ointments. In inflammation of the membrana tympani little pieces of linen covered with the ointment are applied to the inflamed part. In inflammation of the middle ear with largely relaxed mucous membrane, Gruber uses the gelatine preparations recommended by Catti for the nose.

23. At the autopsy of a patient, dead from phthisis pulmonalis, the Reviewer found, aside from extensive destruction of the membrana tympani and considerable swelling of the mucous membrane of the drum cavity, excessive softening of the stapes on both sides, permitting depression or bending of the head of the stapes down to the plate, which then resumed its normal condition. As the rest of the osseous system showed similar softenings, the Reviewer thinks himself justified in assuming the general marasmus as the cause of the malacia.

24. In a short communication, Patterson-Cassels mentions

that he has applied iodoform with good results in ulcerations, especially those accompanying caries of the mastoid process, complicated with polypoid granulations. After removal of the granulations, the dry powder is applied.

25. On an historical review of tenotomy of the tensor tympani follows an exhaustive discussion of the anatomical conditions entering into the consideration. Miot, besides, answers to the objection, that no lasting benefit can be conferred by the operation, owing to constantly present pathological alterations upon which it has no effect, by asserting that there are cases in which the tendon or its sheath alone is affected. The author describes his instrument as a tenotome resembling that of Weber-Liel, with a concave blade at a right angle to the handle. Miot states that in most instances the subjective noises, as well as the impairment of hearing, had been diminished, and at the end reports in detail two cases in which cure followed the tenotomy.

26. In a patient affected with otorrhœa, complicated with swelling of the external auditory meatus and of the region of the mastoid process, Schwabach observed, aside from vertiginous symptoms with the tendency to fall to the left side, the interesting circumstance that nystagmus-like motions of both eyes in a horizontal direction toward the affected side occurred on pressing on the swollen parts. On removing the pressure the motions ceased. Schwabach, on the strength of Cyon's experiments, believes that the observed symptom should be considered as produced by excitation of the semicircular canals.

27. An eight-year-old boy, affected with otitis media purulenta dextra, suffered for a month previously to his coming under Ménière's treatment from attacks of temporary loss of consciousness, with succeeding depression and somnolence. The attacks sometimes occurred several times daily, sometimes after intermissions of from five to six days. After local treatment of the ear affection the attacks diminished in frequency.

28. A fourteen-year-old boy came under Blau's treatment, with the following symptoms: A sensation of pressure on the right ear, temporary lancinating pains in the same increased resonance of his own voice, manifold subjective auditory perceptions, normal hearing power. Membrana tympani normally movable on Politzer's experiment. The following appearances were observed at the membrana tympani: In variable succession, sometimes frequently or again more rarely, spasmodic motions of the mem-

brane occurred ; changes of the cone of light or total retraction of the membrane occurring "with lightning rapidity" were observed. There was no connection with respiration. The boy had no subjective sensations of the motions of his membrana tympani. The author considers the motions of the *M. T.* attributable to contractions of the tensor tympani muscle.

29. Continuing his previous reports of operations, Schwartze contributes six new cases in which either present fistulæ were enlarged or an artificial opening of the mastoid process was undertaken. Two cases are particularly interesting.

After an apparent cure of acute inflammation of the middle ear (case 47) evidences of inflammation of the mastoid process were again observable. Repeated incisions proved useless. Persistence of violent pains referred to the entire half of the head. Although the tympanic cavity was free from pus and the membrana tympani imperforate, the attempt was made to lay the process open by chiselling. Penetrating to the depth of 2 *cm*, still an opening of the antrum could not be obtained, and the operation was abandoned without liberating any pus. Healing with complete removal of all symptoms six weeks after the operation.

In a boy (case 50) suffering from fetid otorrhœa right, very violent, continuous otalgia, fever, and œdema at the mastoid process occurred. On incision, a narrow fistulous opening was found at the height of the antrum mastoideum, was widened with a gouge sufficiently to permit the introduction of a hollow sharp spoon. On scraping out the granulations and the caseous pus, an uncommonly violent hemorrhage occurred, which was stopped by the insertion of a drainage tube filling the osseous opening. Pyæmic fever, development of a metastatic lung-abscess. Recovery from the pyæmia. Death nine weeks after the operation, probably from anæmia (?). No post-mortem.

At the end of his communications Schwartze promises a comprehensive discussion of his hitherto published reports of operations. When Schwartze expresses the opinion that the general application of the operation has been injured by some anatomical researches which he thinks, have exaggerated the dangers met with in the region of the operation, the Reviewer permits himself the remark that by an exposition of the anatomical relations entering into consideration during an operation, the general application of an operation may perhaps be injured, but not the welfare of the patient.

30. Levi describes a modification of catheterization of the Eustachian tube called by him Boyer's procedure. Boyer's method of introducing the catheter consists, as reported by the author in an earlier publication, in guiding the point of the catheter only to the posterior margin of the choanæ, and by turning to bring the mouth directly into the tubal orifice. In Levi's new procedure the catheter is turned during a deep inspiration with mouth closed. Levi believes that in this way no contraction of the muscles of the palate can occur, which in other methods frequently interferes with the introduction of the catheter.

Inner Ear.

Prof. Dr. Moos, (of Heidelberg): Ueber das Vorkommen und die Bedeutung phosphorsaurer Kalkconcremente im Stamme des Gehörnerven. [On the Occurrence and the Significance of Concretions of Phosphate of Lime in the trunk of the Auditory Nerve.] Lecture read at the meeting of Southwestern German Neurologists. *Archiv für Psychiatrie*, Bd. ix, Heft 1. Compare the report on Pathological Anatomy.

32. Dr. Kispert, (of Madrid): Halbseitiger Verlust des Gesichts und Gehörsinnes mit Hemikranie in Folge von Sympathicuslähmung. [Semilateral Loss of the Senses of Sight and Hearing with Hemicrania consequent on Paralysis of the Sympathetic.] *Deutsche Zeitschrift fur pract. Medicin*, Nos. 3 and 4, 1878.

33. Dr. Fischer, (of Pforzheim): Ueber den Einfluss des galvanischen Stromes auf Gehörs-Hallucinationen. [On the Influence of the Galvanic Current on Hallucinations of Hearing.] Read before the meeting of Southwestern German Neurologists. *Archiv für Psychiatrie*, Bd. ix, Heft 1.

32. A woman, æt. 25, suddenly lost sight and hearing on the right side, and exceedingly violent penetrating pains occurred in the right half of the head. Objectively perceptible were only, right, a considerable narrowing of the pupil and dilatation of the retinal vessels; no abnormity in the ear. Kispert's diagnosis of a right-sided paralysis of the sympathicus colli, with consecutive dilatation of the vessels of the right half of the head, was verified by the treatment, all manifestations completely disappearing after four days' use of secale cornutum.

33. In his lecture, of interest also to the otologist, Fischer reports a series of investigations on hallucinations of hearing in the

insane, of which one case is specially noteworthy. It was that of a weakly man suffering from pronounced hypochondriac melancholia with vivid hallucinations of all senses. The hallucinations of hearing consisted in clearly distinguishing the voices of some relatives. On testing the galvanic reaction of the nervi acustici, no sensation of sound was experienced with a strong current, while the hallucinations of hearing ceased almost entirely during the continuance of the current; only twice the patient heard voices—the one, during the flow of the current, was heard as loud, but as coming from a greater distance than customary; the other, while the current was interrupted, was heard in a whisper. Thereupon a regular, galvanic treatment of the brain was instituted: a current of 8 to 10 elements along and across the head. During a daily treatment for two months steady improvement, eventually complete cure; simultaneous continuous increase of bodily vigor. With the hallucinations, the subjective noises accompanying them, also disappeared. From the analogous condition of both symptoms Fischer concludes that they both depended upon the same pathologico-anatomical lesion. The author further believes that delicate disturbances of nutrition in the central nervous apparatus should be considered as underlying the affection.

Naso-Pharyngeal Affections.

34. PROF. V. TRÖLTSCH: Eine weitere Verwendbarkeit der Zerstäubung von Flüssigkeiten. [A further Indication for the Use of Spray.] *Archiv fur Ohrenheilkunde*, Bd. xiii, p. 200.

35. DR. WEBER-LIEL: Zur Anwendung der Nasendouche. [On the Application of the Nasal Douche.] *Berl. Klin. Wochenschrift*, No. 13, 1878.

36. DR. A. HARTMANN, (of Berlin): Beitrag zur Lehre von der Ozäna. [Contribution to the Knowledge of Ozæna.] *Deutsche Med. Wochenschrift*, No. 13, 1878.

37. J. SCHMITHUISEN, (of Accreale): Zur Casuistik der chronischen Blennorrhœa der Nasen-, Kehlkopf- und Luflröhrenschleimhaut. [Contribution to the Knowledge of Chronic Blennorrhœa of the Mucous Membrane of the Nose, Pharynx, and Trachea.] *Berl. Klin. Wochenschrift*, No. 11, 1878.

38. E. WOAKES: Note of Iodoformed Wool. *Brit. Med. Journ.*, Feb. 9, 1898.

39. LENOX BROWNE: Iodoform as a Local Application in Naso-Pharyngeal Disease. *Ibidem.*

40. Prof. Dr. E. Zaufal: Ueber die allegemeine Verwendbarkeit der kalten Drahtschlinge zur Operation der Nasenpolypen. [On the General Applicability of the cold Wire-loop for the Operation of Nasal Polypi.] *Prag*, 1878.

41. Dr. A. Hartmann, (of Berlin): Schwerhörigkeit bei Kindern, verursacht durch chronischen Nasen-Rachenkatarrh. [Impaired Hearing in Children caused by Chronic Naso-Pharyngeal Catarrh.] *Berl. Klin. Wochenschrift*, No. 14, 1878.

42. Dr. G. Justi, (of Idstein): Ueber adenoide Neubildungen im Nasen-Rachenraume. [On Adenoid New-formations in the Naso-Pharyngeal Space.] Volkmann's *Samml. klin. Voträge*, No. 125.

43. Prof. E. Zaufal: Zur Operation adenoider Vegetationen im Nasen-Rachenraume durch den Nasen-Rachentrichter hindurch. [On the Operation of Adenoid Vegetations in the Naso-Pharyngeal Space through the Naso-Pharyngeal Speculum.] *Prag. Med. Wochenschrift*, No. 16, 1878.

44. Dr. H. Bensch, (of Berlin): Beiträge zur Berutheilung der chirurgischen Behandlung der Nasen-Rachenpolypen. [Critical Contributions to the Surgical Treatment of Naso-Pharyngeal Polypi.] Breslau, 1878.

34. V. Tröltsch calls attention to the applicability of the well-known atomizer recommended by him, not only for harmless liquids, but also for stronger substances, particularly solutions of silver nitrate. The atomizer is inserted into a narrow cylindrical vessel, instead of the ordinary large one, and thus any desired number of drops of the liquid in use may be applied in a finely divided condition to the mucous membrane of the larynx, the pharynx, or the naso-pharyngeal cavity, while formerly a manipulation with brush and sponge-holder was required. This application of the apparatus seems particularly commendable for the treatment of the patient by himself.

35. Weber-Liel very fully discusses the conditions under which, in his opinion, the entrance of fluids into the middle ear, by the use of the nasal douche, is possible. Herein he starts from the somewhat incorrect presumption, as Reviewer thinks to have proved by his experimental investigations, that the mouth of the tube is closed by the contraction of the levatores veli. Weber employs as nasal douche a glass syringe with an olive-shaped nozzle. In order to prevent inflammation of the middle ear by the influx of fluid, he recommends the use of a soda solution

in place of the customary common-salt solution of table-salt.

36. Reviewer was unable to confirm Michel's opinion—that ozæna is based on an affection of the cavities adjoining the nasal fossæ—in a patient suffering from a typical form of that disease, on whom he had the opportunity of performing a post-mortem section. The cavities of the ethmoid bone were found normal; those of the sphenoid of small dimensions, so that the secretion must have been formed exclusively from the Schneiderian membrane. As to the origin of ozæna, Reviewer pronounces against the opinion that an originally chronic catarrh with swelling of the mucous membrane, later develops into ozæna with atrophy of the mucous membrane, and believes that the great width of the nasal cavity, which Zaufal lays stress on, is in most cases the congenital disposition causing the disease.

37. Under the quoted heading, Schmithuisen describes two cases of disease from Störk's Clinique. In both, greenish-black scabs, accompanied by ropy, purulent sputa, had been discharged for some time from the naso-pharyngeal space when the patient blows his nose, and from the larynx when he coughed. An examination, chiefly confined to the larynx and trachea, disclosed the formation of scabs in both parts. Therapeutical means proved unavailing. The description shows that in both cases the form of the disease was that commonly designated as ozæna.

38. Woakes believes iodoform to have a specific influence in cases of rhinitis, ozæna, naso-pharyngeal catarrh, and swellings in the naso-pharyngeal space. The ethereal solution causing too severe a pain, Woakes applies iodoformed cotton—a drachm of cotton containing one drachm of iodoform. Small flocks thereof, introduced into the nose, remain for a longer or shorter time.

39. Browne likewise recommends iodoform in chronic naso-pharyngeal catarrh with inflammation of the mucous membrane. He employs the ethereal solution, 1 to 10–12, painting the naso-pharyngeal space two or three times a week. For the patient's own use, Browne orders a mixture of iodoform (5–8 grains dissolved in ether) with vaseline (1 ounce), to be applied by means of a brush through the nose.

40. In the introduction to his extensive treatise, Zaufal calls attention to the connection, caused by the anatomical relation, of affections of the ear to those of the nose, mentions the frequent attack of the organ of hearing in acute catarrh, as well as in chronic affections of the nasal cavity, particularly in ozæna, in

which Zaufal observed the implication of the ear in 80 per cent. of the cases. The frequency of aural affections is somewhat less, according to Zaufal, in nasal polypi (56 per cent.), and, as Zaufal justly emphasizes, the rational treatment of the organ of hearing can primarily consist only of the removal of the nasal polypi, for which purpose Zaufal uses his own modification of Blake's snare.

Zaufal grasps every single polypus with the snare which is pushed up to the root, and cuts the piece seized. He cautions against Voltolini's proposition, to seize and tear off whole bunches of polypi. This caution does not appear entirely justified to the Reviewer, in the presence of a large number of polypi. In Reviewer's experience, the hemorrhage during the tearing off of larger bunches grasped by the snare is scarcely more severe than during the cutting, nor is the pain particularly great, while the polypi are removed more completely and in a shorter time.

To prevent recurrence, the roots should be cauterized by the galvano-cautery, or, instead, with chloride of zinc or nitrate of silver in substance.

41. Basing himself on his experience, the Reviewer disproves the still largely prevailing opinion lately advanced by Störk, that the impairment of hearing in children, caused by chronic naso-pharyngeal catarrh with consecutive proliferation of granulations, was impossible to remove, and that the contraction of the tube could not be overcome. Two cases are more fully described, in which not only a high degree of deafness was improved by the removal of the naso-pharngeal affection, but a better permeability of the tubes was also obtained.

42. After a lengthy introduction treating of the character of adenoid proliferations and the symptoms they produce, Justi recommends for their operation his formerly described sharp spoon fastened to a flexible stem or a ring. He constructed four forms of spoon, according to their intended use at the posterior, anterior, or lateral walls of the naso-pharyngeal space. Reviewer repeatedly operated with Justi's spoon, which proves serviceable if the operation by the help of the mirror fails. The manipulation of the instrument is steadier if a rigid stem is used in place of the flexible one.

43. Zaufal states that he introduces a loop of elastic wire through his naso-pharyngeal specula; this loop, unfolding by its elasticity in the naso-pharyngeal space, is appropriate for the removal of adenoid proliferations.

44. The monograph of Bensch, dedicated to Votolini, is distinguished by an exceedingly careful exposition of the views hitherto held regarding naso-pharyngeal polypi, both in genetic and in prognostic and therapeutic relations. In the introduction the term naso-pharyngeal polypus is defined. The peculiar clinical picture representing a fibrous neoplasm, originating, with a broad basis, in the periosteum of the bony walls of the pharyngeal cavity, and the basilar fibrocartilage, is designated a "clinical naso-pharyngeal polypus."

The clinical naso-pharyngeal polyyus develops in early youth, which fact, according to the author's deductions, proves its connection with the evolution of the skull; and from this manner of development the author forms a favorable prognosis as to relapses and further growth in advancing years. The dreaded hemorrhages do not flow from the tissue of the polypus, but from the investing mucous membrane.

The treatment of naso-pharyngeal polypi forms the most important section in Bensch's treatise, and the operative methods from the time of Hippocrates to the present day are discussed especially the advantages and disadvantages of the definitive and temporary preliminary resections of von Langenbeck. Lastly the author describes the rhinoscopic-surgical procedure of Voltolini, which consists of two steps: 1st. The preliminary extirpation of the polypus, for which the galvano-caustic loop or a gouge, specially constructed for the purpose, is employed; 2d. The destruction of the root under guidance of the mirror, with the cupola-burner.

The valuable work of the author is heartily recommended to every one who takes an interest in the subject and to those who practise rhinoscopic surgery.

NORMAL AND PATHOLOGICAL ANATOMY AND HISTOLOGY OF THE ORGAN OF HEARING.

By H. STEINBRÜGGE.

Translated by Isidor Furst, of New York.

1. Die Gelenke der Gehörknöchelchen und die Knorpel des Ohres. [The Joints of the Ossicles and the Cartilages of the Ear.] By Dr. Eugen Körner. *Monatsschrift f. Ohrenheilkde*, 1878, No. 11.

2. Zur Casuistik der Knochenlücken im Schläfenbein. [The Fissures in the Temporal Bone.] By Dr. K. Bürkner. *Arch. f. Ohrenheilkde.*, Bd. xiv., Heft 2.

3. Die embolischen Erkrankungen des Gehörorgans. [The Embolic Affections of the Organ of Hearing.] By F. Trautmann, *Archiv f. Ohrenheilkde*, Bd. xiv, Heft 2.

Bürkner (1), in an historical review, discusses the views of authors (Brunner, Eysel, Henle) dissenting from Rüdinger's assumption of an intercalary cartilage in the malleo-incudal and the incudo-stapedial joints ; he treats of the connection of the stapes-plate with the fenestra ovalis, after Rüdinger, Toynbee, Magnus, Henle ; and then communicates his own numerous investigations, the results of which confirm Rüdinger's conclusions regarding the intercalary cartilage. The joints of the ossicles were softened in an eight per cent. solution of chromic acid with the addition of from six to eight drops of muriatic acid, and were then divided into thin sections. During this operation the meniscus drops out very easily, if the joints are not quite sound. Both malleus and incus contain a central canal filled with a grumous marrow and drops of fat—the marrow-canal (Rüdinger). The surfaces of the joints in the entire region of the capsule, are covered with hyaline cartilage ; the capsule on the medial is thicker than on the lateral side. The fibro-cartilaginous meniscus is connected at the circumference of its broad margin to the capsule by a loose tissue : while its surfaces nowhere connect with the ends of the joints (invested with cartilage) of the malleus or incus. In the incudo-stapedial joint the conditions are in the main the same. The capsule of the joint is thicker in front than behind, and is fastened to the lenticular process by a strong, circular belt of connective tissue. Some tendinous fibres of the stapedius muscle, traversing the capsule, likewise reach the lenticular process. Of 57 specimens examined Körner found the meniscus in 35.

In the last paragraph the author discusses the arrangement of the cartilaginous tissue at the chain of ossicles (cartilage at the short process of the incus, and that at the margin of the fenestra ovalis), considering it a poor conductor for sound waves, and hence an isolater intended to prevent deflection of sound by the adjoining osseous substance from its course to the labyrinth.

Bürkner (2), by the further examination of ninety-two skulls, finds confirmation of the results concerning the origin of dehiscences and fissures, communicated by him in the thirteenth volume of the Archiv fur Ohrenheilkunde. The percentage of thinnings of the tegmen tympani alone, as well as in connection with the roof of the orbital cavity, was approximatively the same as in his first investigations. He describes three skulls with defects of ossification in the external auditory meatus, two were particulary interesting, showing defective development also in other parts. A thin-walled skull was taken from a man of forty years and showed infantile dimensions ; another came from a crétin thirty years of age.

Trautmann (3) distinguishes between emboli caused by affections of the organ of hearing itself, and those originating in the blood-vessels of distant parts of the body. The results of thirteen autopsies show chiefly endocarditic valvular deposits. The reason why the vessels of the labyrinth are more rarely affected than those of the middle ear is attributed to the curved course of the vertebral artery. On the other hand, coagula enter the more easily the posterior auricular artery, and thence the stylomastoid artery and the tympanic branch, the lower the post. Auricular artery is given off from the external carotid, *i. e.*, the more acute the angle between it and the main trunk becomes. The superior and obtuse-angled bifurcation seems to be of frequent occurrence, hence embolic processes in the middle ear come comparatively rarely under observation. Among thirteen cases communicated. the middle ear was affected four times. He found clearly-defined hemorrhages varying from the size of a millet-seed to that of a lentil, in the membrana tympani, the lining of the incus, the mucous membrane of the tympanic cavity, and the mastoid cells ; besides coagula of fibrine filling the drum cavity and extending through the antrum into the mastoid cells. The microscopic examination of the tympanic mucous membrane showed finely granular emboli in the arteries ; micrococci could be demonstrated only in the connective tissue, but not with any certainty in the vessels. The membrana tympani was particularly affected in its mucous layer. Finally Trautmann reminds us that hemorrhages and fibrinous coagula in the middle ear occur also in parenchymatous nephritis and angina diphtheritica (case of Schwartze and the author), and cites two new autopsies. The embolic affections of the organ of hearing, should they be recognized during life, furnish an unfavorable prognosis *quod vitam*, as they are mostly complicated with other grave diseases.

Regarding Friedreich's case of embolism of the basilar artery, mentioned in the beginning of the paper, we have to report that, according to Friedreich's own statement, an embolus was found post-mortem also in the arteria auditiva interna.

II. PHYSIOLOGY OF THE ORGAN OF HEARING.

By OSCAR WOLF, of Frankfort-on-the-Main.

Translated by Isidor Furst, of New York.

1. Dr. Arthur Hartmann, of Berlin: "Mittheilung über die Function der Tuba Eustachii." [Communication concerning the Function of the Eustachian Tube.] *Archiv. f. Anatomie und Physiologie* by His, Braune, and du Bois-Reymond, 1877.
2. Prof. Dr. August Lucae, of Berlin: "Zum Mechanismus des Gaumensegels und der Tuba Eustachii bei Normalhörenden." [Contribution to the Mechanism of the Soft Palate and of the Eustachian Tube in Persons of Normal Hearing.] Virchow's *Archiv*, Bd. lxxiv.
3. Dr. Arthur Hartmann, of Berlin: "Experimentelle Studien ueber die Function der Eustachischen Röhre." [Experimental Studies on the Function of the Eustachian Tube.] Leipzig: Veit & Co., 1879.*
4. Dr. Arthur Hartmann: "Ueber die Bestimmung der Durchgängigkeit der Eustachischen Roehre mit Hilfe des Quecksilbermanometers." [On the Determination of the Permeability of the Eustachian Tube by Means of the Mercury Manometer.] Virchow's *Archiv*, Bd. lxxiv.
5. Prof. Dr. August Lucae: "Historischer Beitrag zur modernen Ohrenheilkunde." [Historical Contribution to Modern Otology.] Virchow's *Archiv*, Bd. lxxiv.
6. H. Dennert: "Zur Physiologie der Tuba Eustachii auf Grund einer Beobachtung von doppelseitigem organischem Ver-

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* Published end of October, 1878.—Rev.

schluss der Rachenmuendung derselben." [Contribution to the Physiology of the Eustachian Tube, based on an Observation of bilateral organic Occlusion of its Pharyngeal Opening.] *Deutsche Zeitschr. f. pract. Med.*, 1878, No. 44.

7. PROF. V. HENSEN, of Kiel : "Beobachtung ueber die Thätigkeit des Trommelfelspanners bei Hund und Katze." [Observation on the Action of the Tensor Tympani in the Dog and Cat.] *Archiv f. Anatomie und Physiologie* by His, Braune and E. du Bois-Reymond ; Physiologischer Theil, 1878, Heft 4

8. DR. K. BÜRKNER, of Goettengen : "Casuistisches ueber intermittirende Schallperception vom Knochen." [Cases of Intermitting Sound Perception through the Bone.] *Archiv f. Ohrenheilkde*, Bd. xiv, Heft 2.

9. PROF. DR. AUGUST LUCAE : "Statistische Uebersicht ueber die vom 1 November 1874 bis 1 November 1877 in der Berliner Universitätspoliklinik fur Ohrenkranke behandelten Kranken, nebst Bemerkungen zur prakt. Ohrenheilkunde." [Statistical Review of the Patients treated at the Clinic for Ear Diseases at the University of Berlin, from November 1, 1874, to November 1, 1877 ; with Remarks on Practical Otology.] Ibid., Bd. xiv, Heft 2.

10. DR. THORNER : "Beitrag zum Nachweis schwacher Inductionstroeme." [Demonstration of weak Induced Currents] *Berlin. med. Centralbl.*, No. 33, 1878.

In reading the publications enumerated ad 1 to 5, "on the function of the Eustachian tube," and the controversies on this subject between Lucae and Hartmann, the Reviewer cannot forbear remarking that he has followed with but little pleasure and satisfaction the many personal remarks which certainly do not appear to assist in the solution of the mooted question, and which, therefore, ought to have been left off.

To ascertain the function of the tube, A. Hartmann (1) manometrically determined the air-pressure necessary to permit, in various conditions of the tube, the entrance of air into the tympanic cavity. He instituted his experiments in the pneumatic cabinet, in which the amount of pressure exerted by the compressed air could be read off on a mercury manometer. He arrived at the conclusion *that the entrance to the tube remained closed as long as the muscles of the palate are in a state of rest*, *but that it opens in the act of deglutition.* During the act of deglutition, the membranous wall of the tube, relaxed in the state of rest, becomes tense, thus transforming the flexible canal into a rigid one.

Hartmann further stated that a very great condensation of air in the naso-pharyngeal space, up to 200 *mm.* Hg., for itself was not only incapable of causing the entrance of air into the drum-cavity, but, on the contrary, that it pressed the membranous wall more firmly against its cartilaginous roof; by the act of deglutition alone, as described above, is the valvular closure at the mouth of the tube opened. From the drum-cavity, however, even a slightly increased pressure overcomes the obstacle, so that with 20 *mm.* Hg. the membranous wall is lifted from the catilaginous roof, and air escapes from the drum-cavity; proof—the subjective sensation of escaping air-bubbles when the air in the pneumatic cabinet is rarefied.

Lucae (2) observed the motions of the mouth of the tube in two persons of normal hearing, in whom extensive syphilitic destruction of the nasal septum and the muscles permitted a clear inspection of the tubes in the state of rest, as well as during phonation and deglutition. He arrived at the conclusion that *the mouth of the tube is compressed when the soft palate rises, to be opened again when it falls, hence that a kind of pumping action takes place.*

Both observers concur in the belief that the act of deglutition furthers the ventilation of the tubes and the tympanic cavity. But Lucae now adds that probably an internal dilatation accompanies the external closure of the tube.

Hartmann (3) then treated the question more fully in a monograph based on extensive experiments. In the first chapter he gives, with doubtless impartiality, an historical review of previous investigations. In the second, headed, "Permeability of the Eustachian Tube in the State of Rest of the Muscles," he describes his observations on twenty-two persons—six of whom were physicians—in the pneumatic cabinet, and arrives at the conclusion that very great condensation of the air in the naso-pharyngeal space impedes the opening of the tube even in the act of deglutition, by pressing the membranous part of the tube against the cartilaginous roof, as mentioned above. In the third chapter he discusses the state of the Eustachian tube during respiration, and proves that ordinarily no exchange takes place during respiration, between the air in the tympanic cavity and that in the pharynx; only in *abnormally* pervious tubes are motions of the membrana tympani observed in consonance with the variations of pressure in the naso-pharyngeal space during respiration. The succeeding chapter proves experimentally that, in Valsalva's experiment, air enters the tympanic cavity on an average with a pressure of from 20-40 *mm.* Hg. Hartmann further investigated the condition of the Eustchian tube during phonation, and found that phonation can only facilitate the passage of air, but by no means completely open the tube, as deglutition does. In deglutition the tube opens only during the first movement of swallowing, at the moment of the greatest contraction of the muscles, which may be clearly demonstrated by the simultaneous observation of the membrana tympani.

The *direct inspection* of the mouth of the tube in the living finally confirmed to the author Zaufal's view: "that the muscular contraction during the act of deglutition moves the medial cartilaginous plate of the tube backward and medially. In this way the floor of the mouth of the tube expands by the separation of the lateral walls from each other, at the same time, the prominence of the levator advances toward the orifice of the tube, which thereby is narrowed in the direction from above downward, and in the direction from behind forward.

In the ninth chapter he discusses the sound-conducting power of the tube, without giving a definite opinion as to its acoustic function. The Reviewer may in this place be permitted to call to mind that he (Sprache und Ohr, p. 240 seq.), classed the tube among the "protective parts of the ear," and demonstrated it to be a tube for the outlet of sound; namely, the anatomical constitution of this tube materially facilitates its function—to permit the escape of sound waves from the rigid walls of the osseous tympanic cavity into the external air. If we consider that the cartilaginous auricle appears excellently adapted to the conduction of sound waves from the air to the osseous auditory meatus, it is on the other hand a favorable condition that the sound waves can return to the external air from the tympanic cavity and the osseous portion of the tube through its cartilaginous part. For acoustic purposes it is immaterial, whether the tube, in the direction toward the ostium tympanicum, is open or slightly closed by contact of the folds of the mucous membrane. Interesting, and to a certain extent indirectly confirming the opinion of the Reviewer, is the proof furnished by Hartmann that a very slight excess of pressure of 22 *mm.* Hg. from the tympanic cavity suffices to overcome the closure of the tube. Hereby it may by explained that even considerable excursions of the membrana tympani, produced by loud sounds, do not cause a compression of the relatively small quantity of air in the tympanic cavity, but that the air easily escapes through the tube. If our ear lacked the described protective apparatus, loud sounds could scarcely fail to produce grave alterations in the organ.

In the last two chapters of Hartmann's monograph we find some practically valuable remarks on the condition of the tube in various pathological conditions, and rules for the use of the nasal douche. The succeeding little article of Hartmann (4), which once again turns against Lucae's attacks, and the latter's reply (5), in seven, respectively nine, closely printed pages, contain nothing new.

Dennert's (6) patient in question was 38 years old. Extensive syphilitic destructions in the naso-pharyngeal space. In place of the normally visible parts, white cicatricial tissue. Hermetical shutting off of the buccal from the naso-pharyngeal space by the cicatricial union of the soft palate. In the act of deglutition no motion of the soft parts perceptible anywhere in the naso-pharyngeal space. Bilateral impaired hearing and subjective noises. In both membranæ tympanorum, more perceptible in the left, distinct sinking in during the act of deglutition, with subsequent outward movement. These appearances were not influenced by closure of the nose during deglutition. The same observations could be made on a plug of mucus within the incised membrana tympani. Dennert explains the described phenomena by the dilatation of the tube in the act of deglutition, and as ventilation was impossible on account of the organic closure of the pharyngeal mouth of the tube, this dilatation must be followed by a rarefaction of the enclosed air, which in turn moves the yielding parts of the membrana tympani toward the drum cavity by aspiration, thus causing a negative oscillation.

Hensen (7), after a short historical exposition of the present state of our knowledge of the functions of the tensor tympani, publishes a small series of experiments instituted by him in such manner as to lay open the tympanic cavity in a slightly curarized dog and a cat, a pin being inserted into the belly or tendon of the tensor tympani muscle. It was shown that every sound, every tone caused motion of the pin ; higher tones were followed by much stronger oscillations of the muscle than lower ones, and with organ-pipe tones of less than 200 vibrations it remained doubtful whether or not any motion at all followed, while the muscle reacted on words pronounced in deep bass voice. If the tone was sustained, the pin came to rest. Hensen further observed a stronger tremor of the muscle on first striking a tone, and at the beginning of a syllable. Something confirmatory of this view will be found in Blake's communication (these ARCHIVES, vol. vii, p. 457, etc.), according to which a distinct excursion of the membrana tympani was observed by the variation of the atmospheric pressure on pronouncing the so-called explosive sounds, B, T, etc. Hensen himself gives to his paper the character of a preliminary communication, hence we may expect that the author will find time and opportunity to proceed, by means of further experiments, to the solution of the questions raised by himself, and to the settlement of the points still left doubtful in his essay.

Buerkner (8) made the observation, "That the ticking of a watch applied to the bones of the skull, is heard by not a few ear-patients at one time quite loud, at another much more faintly or not at all," the subject of further investigations, and came to the conclusion "that the intensity of sound perception by the bones of the skull, if inconstant, is directly proportionate, at least in affections of the middle ear in general, to the hearing distance by air conduction" [? REV.].

The author illustrates this proposition by the histories of six cases, which contain nothing remarkable and cannot be used in proof of any assertion, inasmuch as, on the one hand, the diagnosis was uncertain in some cases; on the other hand, as the subjective observations of children of ten and twelve years are unreliable, and, finally, as the test of bone conduction, in general, yields rather unavailable results.

Lucae (9) adds to his "Review of the Ear Patients treated at the clinic of the Berlin University," some notes on functional examination, which the Reviewer desires to communicate in this place as belonging to the physiological part of these reports. The process of Lucae's method of examination was this: "That, after testing the acuteness of hearing for whispered speech, after employment of the otoscope, and, wherever possible, even in children, of the catheter in all cases where inflation produced negative results, the perception of tones differing in pitch, was examined with loud tuning-forks, from bass G to c^4 in octave intervals.' Koenig's steel rods, and other acoustic appliances which need not here be mentioned, were more rarely employed.

"This caused the surprising observation, that a series of affections which would have been classified, according to the objective examination and the usual terminology, among 'chronic catarrh of the middle ear,' revealed themselves as marked affections of the inner ear, since the examination discovered a great difference of perception between high and low tones, mostly a surprisingly good perception of the *lower* tones, contrasting with imperfect perception of speech."

Lucae then mentions the examination of a patient with a labyrinth affection, who, though clearly perceiving the low tuning-fork sounds, corresponding to the pitch of the vowel U from bass G to c^1, yet did not understand the vowel U itself, and concludes that the patient could not hear the higher partial tones necessary to the characteristic u-sound ; or, which appears more probable to the author, that the patient did no longer perceive the low sounds as tones, but only as uncertain noises. Inasmuch as not all patients are able to give reliable information as to *what* they hear when examined with acoustical instruments, Lucae arrives at the result "that speech is to be considered as the only reliable hearing test of general value." The Reviewer begs to state that he arrived at this and some other conclusions, based on extensive acoustic examinations, as early as 1874 (comp. ARCHIVES OF OPHTH. AND OTOLOGY, vol. iv, p. 67, etc., and p. 267, etc.), which seem to have been overlooked by Mr. Lucae.

Thorner (10) proved by experiments that the telephone may occasionally be employed to advantage for the detection of induced currents too weak to be perceived even by the tongue.

VOL. VIII. No. 3.

ARCHIVES OF OTOLOGY.

AN INSTRUMENT FOR REMOVING FLUIDS FROM THE TYMPANUM.

By Dr. SCHALLE, of Hamburg.

Translated by James A. Spalding, M.D., Portland, Maine.

Since the beginning of our medical knowledge of the diseases of the ear, it has been well known that fluids may be present in the tympanum, with and without perforation of the memb. tymp. If physicians in former times were unable to diagnose this condition accurately, they often learned "ex juvantibus," that they had guessed correctly. We owe it chiefly to the works of Schwartze * and Politzer † who could support themselves upon the experience of others, and upon improved methods of examination, that the diagnosis and treatment of these affections have reached their present stage of development.

Since it was never doubted, but that the presence of fluids in the tympanum, of no matter what consistency they might be, must cause decided harm, everyone strove eagerly to

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* *a*, Studien und Beobachtungen über die künstliche Perforation des Trommelfells. *Arch. f. Ohrenheilk.*, Bd. ii, 24, 239, 245 ; Bd. iii, 281 ; Bd. vi, 171.
b. Die Paracentese des Trommelfells, Halle, 1868.

† *a.* Ueber bewegliche Exsudate in der Trommelhöhle. S. A., *Wien. Med. Presse*, 1869.
b. Therapie der beweglichen Exsudate in der Trommelhöhle. S. A., *Wien. Med. Wochenschr.*, 1870, Nos. 35, 37, 39, 41.
c. Ueber die Anwendung des Trommelhöhlencatheters. S. A., *Wien. Med. Wochensch.*, 1873.
d. Ueber die Entfernung beweglicher Exsudate aus der Trommelhöhle. S. A., *Wien. Med. Wochensch.*, 1874.
e. Ueber die Anwendung des Paukenröhrchens. S. A., *Wien. Med. Wochensch.*, 1878.

find means for their removal ; some of which I will mention briefly :

1. Syringing of the tympanum from the tuba outward by a catheter.
2. Suction by the catheter to empty the tympanum.*
3. Suction of the exudation from the tuba outward, by means of the tympanic catheter.†
4. Politzer's method was used, after the patient had bent his head towards the side opposite the diseased ear, and very much forward.‡
5. Suction of the secretion by a Pravaz' syringe, which was pushed through the memb. tymp. from the ext. aud. meat.§
6. The catheter, Politzer's or Valsalva's method used methodically for some time, in order to cause resorption of the fluids in the tympanum, by their continual pulverization.

All of these methods have been praised by some, rejected by others, while the fact is, that in most cases, they all leave us in the lurch.

The best means remains undoubtedly the paracentesis of the memb. tymp., which Busson ‖ suggested as treatment for the removal of exudations. After his time, many agreed with his views, while it is Schwartze's merit in having been the first to sharply define the indications and technique of this operation. I refer ¶ to his publications in order to turn my attention exclusively to the removal of the exudation, after the paracentesis has been made.

The fluid often escapes at once after a successful operation, if this does not happen we drive it out by Politzer's method, the catheter, or Valsalva ; if these then do not succeed in removing the tenacious secretion, we usually resort** to syringing with saline solutions, with or without the catheter. Politzer* expresses himself decidedly against all abundant injections of saline solutions, because they may excite the mucous membrane of the tympanum and the edges of the wound to rapid inflammation. The same author recommends† that we should for this purpose resort to rarefraction of the air in the aud. meat., which can be easily accomplished by sucking with the mouth the end of an india-rubber tube, which has been inserted air-tight, and he advises us at the same time to have Valsalva done from behind. We must add however, that Politzer also uses the Weber-Liel tympanic catheter in order to force the air through the tube into the tympanum, and then the exudation out of the latter.‡

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* Valeroux 1843. Rau, *Lehrb. d. Ohrenheilk.*, 1856, §122.

† Weber-Liel, *Monats. f. Ohrenheilk.*, 1869, pag. 23.

‡ Ueber die beweglichen Exsudate in der Trommelhöhle, pag. 10.

§ Hinton. The diseases of the ear, by Toynbee, with a supplement by James Hinton, mentioned by Schwartze. *Arch. f. Ohrenheilkd*, Bd. v, pag. 220.

‖ Dissert. An absque memb. tymp. apertura topica in concham injici possint. Paris, 1748. Haller's Diss. chir. ; tom ii, No. 44, pag. 235.

¶ See note on preceding page..

** Schwartze. *Arch. f. Ohrenheilk.*, Bd. vi, pag. 188.

Gruber, moreover, described a syringe§ for the suction of fluid substances from the middle ear. He suggested this to prevent the dangerous pulverization of pus toward the mastoid cells, which catheterization often causes. From the drawing which is given in natural size, this syringe is 15 *cm.* long, 9 *cm.* of which belong to the canula, which is 2–2.5 *mm.* thick. These measurements, as well as the relatively slight angle of the canula near the piston, the relatively large angle at its point, and especially the *stiff* union between the syringe and the canula, may admit of the suction of purulent masses from the tympanum in chronic purulent inflammations of the middle ear with larger and more or less round openings, but they must be a decided obstacle when we desire to pass the point of the canula, through a speculum for examination or operation, between the edges of freshly-made perforation wounds, which are usually but slightly gaping. In such cases, diminution of space, accompanied with defective illumination, and diminished freedom of manœuvering, must occur. These are my reasons for rejecting this instrument, and seeking for another more handy. The result is my present exudation-sucker, which I have used exclusively for this purpose for fully four years, abandoning all other methods.

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* *Lehrb. der Ohrenheilk.*, 332.

† Therapie der beweglichen Exsudate, 18 fo, pag. 16.

‡ Ueber die Anwendung der Pankenhöhlencatheters ; 1872, pag. 8.

§ *Monats f. Ohrenheilk.*, viii, No. 12.

This instrument consists of a fine canula, 4 *cm.* long, and 1.4–2.5 *mm.* thick, running into a funnel-shaped closed tube 4 *mm.* in entire circumferencs, increased by a small ring-shaped prominence, which bends at nearly right angles from the anterior, thin, horizontal part of the canula. (See figure. 1.)

NATURAL SIZE.

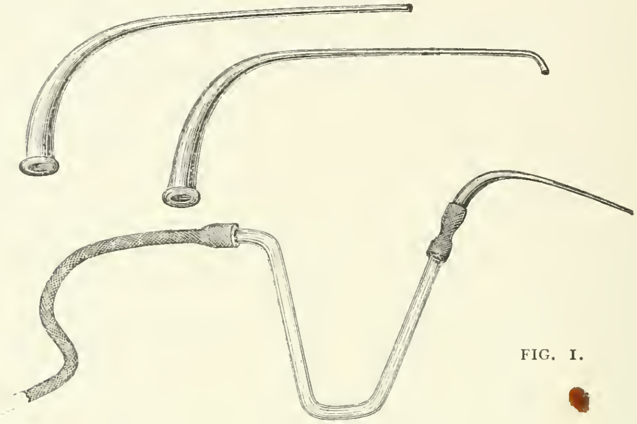

FIG. I.

ONE-THIRD OF NATURAL SIZE.

The thicker part of the canula is united by a short india-rubber tube with a glass tube bent at an angle, to the end of which again a rubber tube about 30 *cm.* long is united. In order to gain the largest possible calibre in so thin a tube, and on the other hand to avoid oxydation as much as possible, the canula piece is wrought of massive fine silver, without soldering.

If I desire now to use this suction-instrument, after the perforation has been made, I take the rubber tube into my mouth, pass with my right hand the glass portion of the instrument into the aud. meat., through the same speculum which I had left in the ear after the operation, push the point into the tympanum between the edges of the wound, and make suction. The introduction through the speculum and the edges of the perforation is very easily accomplished, because the whole field of operation is illuminated by the mirror directed by the left hand, and with exception of the fine silver suction-tube, nothing interferes with the light. If no more exudation follows the first movements with the mouth, as we notice by the bubbling sound, we withdraw the canula, blow out its contents, if not very copious upon the left hand, so as at once to notice its consistency, and then repeat the method as many times as is needful. If the exudation is very tenacious, it is more difficult to remove on account of the large surfaces of adhesion at the entrance to the antrum, and especially at the floor of the tympanum lying deeper than the lower edge of the memb. tymp. In such a case, we follow up with a canula bent about 3 *mm.* near the point, directing it backward and upward inside the tympanum. This procedure, however, is difficult in the case of very sensitive patients, after a freshly made perforation, and we must naturally act here very gently. If the exudation is very moderate, we do well meanwhile to cleanse the instrument by removal of the canula, in blowing the glass tube free ; because the secretion adhering to it prevents the fluid within the tympanum from entering into the canula. We use now the straight and now the curved canula, according to the condition of the exudation, and, when practicable, the latter is always convenient, because its point, directed straight forward, passes more easily between the edges of the wound than the one that is bent.*

We can make use of any sort of ear specula for the operation and suction, but the hard rubber operation-specula used by Weber-Liel seem to me the most useful for these purposes, as well as for all operations to be undertaken upon the memb. tymp., or in the bottom of the meatus.

I have, however, modified these a little, in so far as I have had them made of an oval form.† They have very thin walls, and on account of their small size (2 *cm.*) and very steep conical form, they can be introduced deeply into the meatus, and directed by the little finger of the left hand, while the two first fingers of the same hand hold the illuminating mirror. In this way, especially with these small ear-specula, we find it most easy to operate, etc., without the head-band, the use of which is always inconvenient, and which we do best in avoiding as long as we can. I use this latter only in the difficult cases, where I have to make a path for operating instruments, *e. g.*, the smallest cautery to the lowest part of the memb. tymp., which, as is well known, is most withdrawn from observation by the external curvature of the meatus, and especially in the case of very sensitive patients, like nervous people and young children,

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* It does not do to use only one canula, and to bend it every time when needful, because such fine tubes must be bent from the beginning, and besides this, with the thinness of their walls, they would soon become knotted.

I formerly had not used the silver adjustment with a glass tube bent angularly, but united it directly with my mouth by means of a rubber tube. But after I had once received into my mouth, at the very first draught, a very copious, and, at all events, a very thin exudation, I resorted to the use of the glass tube, in the cavity of which an abundant amount of secretion can be collected.

† Deicke, instrument-maker, Johannisstrasse, Dresden.

The galvano-cautery is much more to be recommended for perforation, than sharp instruments. I employ three cauterizers, the conducting wires of which have a transverse diameter of 2.5–3.0 *mm.*, a perpendicular diameter of only 2.0 *mm.*, and an anterior cauterizing-surface of 2.0 *mm.*, 1.5-*mm.*, and 1.0 *mm.* These cauterizers occupy but little light on account of their extreme curvature and small size, so that they can be introduced through narrow specula, and with good control of illumination, to every district of the tympanum for the destruction of granulation, and to every portion of the memb. tymp. for paracentesis. The openings made by the galvano-cautery are of a rounded shape, and have smooth edges. In this way they offer a greater chance than the edges of incised wounds for the exit of secretions from the tympanum. I would mention additionally, that we should *always* make the cauterizing surfaces white-hot, because with red-heat we gain less sharpness.*

Besides its use in the suction of exudations after paracentesis, the suction-instrument serves to remove pus, mucus, etc., in otitis media pur. chron. Every practitioner knows how hard it is, in spite of syringing, and the use of numerous little wads of charpie, or cotton introduced with thinbranched forceps, to cleanse the diseased mucous membrane thoroughly from the tenacious fluid that covers it, in order then to quiet it with the proper remedy, astringents, etc. Ever and anew, new pus comes from the tympanic cavity still covered with the remains of the memb. tymp., and we soon have to ask ourselves whether we do not do more harm by long continued manipulation, than we can remedy by astringent or cauterizing treatment. Nevertheless, without precise cleansing, a cure, if not impossible, (natural cures prove that) is put off to a later date. Here now the new instrument comes in play, since we can push the bent part of the canula into the hidden district, keep it under control of the light, and remove the fluid by suction. In the same way we succeed even when the meatus is swollen, in removing pus and detritus through the canula, which we have pushed into the bottom of the meatus. In the latter cases it often happens that suddenly no more fluid will follow, since some bit of tissue has been drawn in at the bottom, which naturally cannot pass through the canula. Hence we do well in withdrawing this together with the choked canula, in order straightway to bring out such firmer masses.

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* In testing the heat we must be very careful, since such small cauterizers burn through in a moment if the current is but moderately strong. If we have freshly-filled v. Bruns' elements, we should use only one-quarter element. The cauterizers can be found at optician Schwenke's, Hamburg, Steindamm.

The instrument is further available for syringing deeper-lying portions of the tympanum for which purpose Politzer recommends the Weber-Liel tympanic catheter. In order to do this, we place the syringe itself into the glass tube, or in order to gain more mobility, we insert a piece of india rubber tube between the two.

We can further use the suction-instrument, for cleansing fistulous passages which open from the mastoid process to the ext. aud. meat., and outward.

We might further employ the instrument to inject various remedies, just after we have made a perforation, and so oppose the new-formation of secretion; a procedure which could only make itself available for the chronic catharrhal form.

Finally, I should like to ask, whether in cases in which we should introduce remedies into the tympanum, it would not be better to provide a canula, like that on my suction-instrument, with a steel point to push this from the aud.

meat. through the memb. tymp. into the tympanum, in order in this way to introduce remedies through the canula by means of a small syringe, than to rely upon so unsafe a procedure as a catheter and Provaz syringe, since in most cases, only the entrance to the tube and portions of the throat that are quite unaffected are touched. Since experience teaches us with how little reaction the usual paracentesis operation is followed, no real suspicion could be raised against such a therapeutical procedure.*

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* The exudation-sucker is made by Deicke, Instrument-Maker, Johannisstrasse, Dresden.

A CASE OF CLOSURE OF THE AUDITORY MEATUS AND LOSS OF HEARING BY THE FORMATION OF EXOSTOSES, COMPLICATED WITH ACUTE PERFORATIVE INFLAMMATION OF THE MIDDLE EAR, WITH REPEATEDLY RECURRING GRANULATIONS—RESTORATION BY THE USE OF LAMINARIA AND GALVANO-CAUTERY.

By S. MOOS, of Heidelberg.

Translated by J. A. Spalding, M. D., Portland, Maine.

MR. H., a medical student, consulted me for the first time May 6, 1878. *He had never had any disease of the ear, but had become totally deaf on the right side within the last two days.* Neither pain nor subjective sensations of hearing nor a discharge had preceded the deafness ; on the whole the patient does not know what to offer as the cause of the disease. Besides deafness, he also complains of a feeling of fulness in his right ear.

Present state.—All tuning-forks are heard from the bones of the cranium upon the diseased side ; he also has bone-conduction for watches, ticking with various degrees of intensity. A watch that should be heard at 9 *m.* was heard by air-conduction only when on contact with the right ear ; voice was understood at 1 *m.* Examination showed at about the middle of the ext. aud. meat. :

a. A large globular exostosis springing from the posterior wall of the ext. aud. meat., and completely filling its whole calibre. This exostosis bears upon its upper circumference a second smaller one, resting upon the larger with a broad base, and running somewhat to a point in the direction towards the upper wall of the meatus. Its surface is dull-white, while the cutaneous envelope of the large exostosis appears red and thickened. The gap which the large globular exostosis still leaves open in front and upward is filled (*b.*) by a more club-shaped exostosis running towards the anterior and upper one in a circular direction with its thinner portion extending downward and its thicker portion upward ; between this and the anterior upper surface of the large globular exostosis is a small hollow, through which, however, it is impossible to penetrate any deeper inward with the probe. The cutaneous envelope of *b* resembles that of *a*.

This was evidently a case of *acute closure* of the ext. aud. meat., due to the presence of bony excrescences; the examination with the probe had not left the least doubt as regards the bony nature of the excrescences. On account, however, of the peculiar nature of their coverings, it might be merely a transitory closure, and I therefore decided upon a more expectant treatment.

Until May 10th I ordered instillations of a weak solution of zinc sulph.; indeed the condition seemed to improve somewhat since the hearing distance for the 9 *m.* watch increased to 0.35. But as pains ensued, although quite moderate, I omitted the astringent. May 13th, the surface of the swelling showed slight purulent discharge, and as the hearing distance sank again I tried the application of laminaria. A laminaria rod 2 *mm.* thick was introduced into the fissure before described, and an attempt was made to retain it in position by plugging the meatus with wadding. It remained in position twenty-four hours, but violent and constant pains lasted until it was removed, when it showed itself swollen to 5 *mm.*, not in circumference, but along its orifice. The probe then penetrated somewhere further inward than before, but not entirely through. Hearing distance, 0.50.

May 15th.—Violent purulent discharge; repeated application of a laminaria rod 1 *mm.* broad. Violent pains at evening, which diminished on the morning of the 16th. The laminaria lies still as on May 15th, and was left for another day, with continued pain. Two days later, it was swollen to 5 *mm.* in circumference. The fissure between the anterior and posterior exostosis was enlarged, and the surface of the latter suffused with blood.

In this condition the patient was presented at the clinic May 18th. Abundant purulent discharge, and moderate pains were present until May 20th. May 21st: He was free from pain, but there was the same abundant purulent discharge from the surface of the exostosis. The treatment was slight after May 18th, with the exception of cleanliness. The pains renewed themselves on May 22d, and the fissure seems somewhat broader; hearing distance 0.70. May 23d: The surface of the exostosis was cauterized with lapis infernalis, causing pain which extended into the concha; abundant purulent secretion, but otherwise no alteration of condition. May 24th: He was free from pain, and a laminaria rod, 1 *mm.* thick, was introduced. May 25th: It was removed after twenty-eight hours, having caused incessant and violent pains during the whole period. The rod was swollen to 5 *mm.* in circumference. The surface of both exostoses was excessively granulated, and the fissure choked by the granulations, which grew luxuriantly till May 27th, when they were removed with the snare, causing excessive bleeding. May 28th: He was free from pain, and the granulations, which had begun to sprout, were again cauterized. May 29th: Early in the morning he has *excruciating pains in the bottom of the ear, spreading over the temple, forehead, and occiput,* and lasting till May 30th.

"Early this morning I felt as if something had broken in my ear." Very considerable discharge with diminution of pain. For the first time to-day, we could pass the 2 *mm.* thick end of the probe, beyond the exostoses in front and above; hearing distance 0.60; instillations of warm water.

June 1st.—The pain is less, and the discharge excessive. A granulation is visible just beyond the former place of closure, and is cauterized at the clinic with the galvano-cautery. June 3d: The space between the exostoses is larger, discharge considerable, and pain slight. The perforation-sound is heard on using Politzer's method, while blood and pus are driven from the fissure between the exostoses there is still a large granulation, which is removed with the snare. June 7–14: Shows but slight alteration. June 14th: Hearing distance 0.45; there is no pain, and the discharge is decreasing. Water does not flow into the throat on syringing, and the perforation-sound with Politzer's method is scarcely noticeable. June 17th: The granulations have grown anew beyond the exostoses, and are removed by the galvano-cautery. The patient syringed his ear with solutions of alum till June 26th. June 27th: Discharge of blood, with recurrence of the granulations which were destroyed again with the galvano-cautery. June 29th: The same.

July 2d.—The same treatment was continued on account of the repeated growth of the granulations. July 6th: A large piece of the granulation fell off, accompanied with bleeding; galvano-caustic treatment. July 9th: The secretion is almost null, and there is not a trace of granulations. A whisper is heard at 4 *m.* July 13th: The discharge has wholly ceased, and a whisper is heard at 6 *m*; and July 20th, at 8 *m.* July 22d: The ear is quite dry, and the covering of the globular exostosis is dry and pale. *The anterior exostosis has wholly disappeared.* The exostosis *a*, with the smaller one resting upon it, is the only one that remains. A narrow open space was found between the large exostosis and the lower anterior wall; the space in front and above was so large that we could see the anterior-upper quadrant of the memb. tymp. The hearing distance was 6 *m.* for a watch of 9 *m.* hearing-distance. The patient is wholly free from every annoyance and has the same feeling on both sides, when air is driven in by Politzer's method.

Nov. 30, 1878.—The patient's condition is the same as on July 22d. All tuning-forks are heard on the right side by bone-conduction and Politzer's acoumeter at 10 *m.*

I should like first of all to add a few words about the peculiar form of the exostosis described as *b*. As I mentioned, it had great resemblance to a club, into the concave handle of which, if we continue the comparison, the upper anterior convex segment of the exostosis *a* pressed, and filled up the space. We might indeed almost believe that the form of the smaller exostosis had been altered by the pressure of the larger one growing against it. The final hermetical closure of the ext. aud. meat. took place, indeed, in front and above, at which spot also the operative attack was made. The closure was due to an inflammatory swelling of the soft parts, and made itself noticeable in the very beginning, by the almost complete deafness, long before the appearance of the purulent discharge. The granulations between the exostoses were probably due to the introduction of the laminaria, and probably also to the fruitless cauterizations with lapis infernalis. I regard the granulations springing from the bottom of the meatus, as symptoms of purulent perforative inflammation of the middle ear. For *these* granulations, the application of the galvano-cautery proved of great benefit. On account of its frequent application, and the extreme narrowness of the field of operation, it was impossible to avoid a simultaneous cauterization of the exostosis *b* and this might have contributed most to its destruction, which was confirmed at the end of the treatment.

If the application of laminaria contributed decidedly to the enlargement of the closure, the lion's share in the perfect cure of the case belongs to the galvano-cautery. It is very probable, that we could have reached our goal in this case with the use of galvano-caustics alone; but future observations will decide this possibility.

The acute perforative inflammation of the middle ear ensuing in the course of the disease, was indeed secondary, and due to propagation from the external auditory meatus.

THE USE OF TOYNBEE'S ARTIFICIAL EAR-DRUM.

By CHARLES E. HACKLEY, M. D., New York.

SOME years since were published* histories of several cases of perforation or absence of the drum membrane, which were greatly benefited by the use of Toynbee's artificial ear-drum.

This little appliance does not seem to be so generally used as it deserves, possibly because it has been tried in unsuitable cases, or because of the neglect of some apparently trifling rule for its use.

Hence it may, perhaps, be admissible to return to the subject, without having anything new to say on it beyond giving hints as to the employment of the artificial mem. tympani, which personal use has proved to be advantageous.

Yearsley, in telling how the cotton plug recommended by him is to be adjusted, says: "But care must be taken that the entire opening be not covered, otherwise the experiment will not succeed. It is also indispensable to success that the moisture of the wool should be preserved."

This quotation may indicate two of the several points to be considered. 1. Why not cover the "entire opening?" So you may and should if the Eustachian tube be pervious; otherwise, by hermetically sealing the opening in the *M. T.*, you will replace the deafness due to imperfect drumhead by that due to sunken drum, etc. 2. Why should the "moisture of the wool" be preserved? If the plug becomes dry it absorbs moisture from the middle ear, and it seems as if one of the chief uses of an artificial drum membrane would be to keep the mucous membrane of the middle ear moist and in a perfectly pliable state, thus enabling the ossicula which it envelopes to move with perfect facility. When the drumhead no longer acts as a protector, the watery portion of the mucous evaporates, not so rapidly, of course, as it would if more completely exposed to the air, but sufficiently to leave a dry, crusty residue.

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* *American Journal of Medical Sciences.*

The quotation from Yearsley thus interpreted would lead us to secure permeability of the Eustachian tube and apply an artificial drum of such a character as will not absorb the secretions from the mucous membrane and will protect it from the atmosphere. The best instrument that we at present have for this purpose is Toynbee's artificial membrana tympani.

Perforation of the drum membrane is rarely the sole lesion; when it exists we shall usually find thickening of the membrane lining the tympanum, derangement of the articulations of the ossicles, otorrhœa, etc., etc. These, of course, will demand our attention before we can hope for benefit from introduction of an artificial mem. tympan. But when by proper treatment the amount of discharge has been limited, the protection afforded by Toynbee's instrument, is often an aid in treatment. I have several times seen perforations heal under its use with no other treatment than syringing with warm water.

About the introduction of the instrument it is unnecessary to say anything more than Toynbee says in his Textbook; after it is in position I often find it advantageous to apply the end of a rubber tube, over the wire handle, into the meatus, and by a quick blow drive the rubber close against the remains of the membrana tympani.

The full improvement of hearing that may be hoped for is rarely attained at once, but often it may be half an hour after the introduction of the instrument before any great change is observed, and the full benefit is often not attained for some days.

After the rubber has been trimmed to fit the ear, and the wire handle has been cut to the proper length, the patient can readily introduce the instrument and soon learns to place it better than the surgeon can.

To recapitulate: the cases which have seemed to be benefited by the use of Toynbee's artificial drum are those where the Eustachian tubes were pervious and where extensive damage had not been done to the ossicles by the previous inflammation. Moreover, the benefit is not always immediate; and in my experience the improvement in hearing has often been proportionally greater for the voice than for the watch.

FOUR CASES OF SEVERE DISEASE OF THE MASTOID PROCESS.

By S. MOOS, of Heidelberg.

Translated by J. A. Spalding, M. D., Portland, Maine.

CONSIDERING the abundant literature bearing upon the subject now before us, in which the works of Shwartze (so well known to every aurist) on the surgical opening of the mastoid process have the preëminence, a series of only four cases, even if they are chosen from many others, must appear *very modest*. And yet, if I come forward publicly with these cases, it is wholly in the interest of the diagnosis and symptomatology of those diseases of the mastoid process, in which the osseous part of the auditory meatus is chiefly involved. Of the cases here communicated, which were complicated for the most part with subsequent affections of the brain, or pyæmia, or both, the extreme posterior portion of the mastoid process in two cases remained entirely free in every respect. Three of the cases ended favorably, the fourth fatally.

Case 1.—*Purulent perforative inflammation of the middle ear, after measles, followed by caries with necrosis of the mastoid process, and formation of polypi on the posterior wall of the bony aud. meat. Rapid healing after removal of the sequestrum.*

R. W., æt. 12, was brought to me by his mother, May 17, 1875. The disease of the boy's right ear developed itself rapidly two years before, after measles. A discharge from the ear followed quickly after violent pains, and has lasted until to-day. Besides this, as I was informed, a swelling came on about nine months afterwards behind the ear, accompanied by the formation of "growths" in the ext. aud. meat., with a bloody discharge. The swelling behind the ear opened, and discharged much pus ; it filled again at a later date, was treated by the family physician with tincture of iodine, and the growths in the ext. aud. meat. were cauterized.

Present State : Bone-conduction for all sources of tone continues on the diseased side ; the comprehension of speech is direct. The right auricle stands out almost at a right angle to the surface of the skull ; the mastoid process is red, swollen, and tender on pressure, with a distinct feeling of fluctuation. A moderately granulated fistulous opening is discovered at about the middle of the swelling. The external meatus is filled with several polypi springing from the posterior bony wall, just at the point of junction of the cartilaginous with the bony meatus. The sound, when introduced, touches upon rough patches in the region just described.

I was unable, by syringing with water, to establish a communication between the fistulous opening in the mastoid process, and the carious patches in the ext. aud. meat. I first rested my diagnosis on caries of the mastoid process, and then basing myself upon the results of the bone-conduction, I declared, in case the affections of the bone ran favorably, that the relative restoration of hearing was possible, although a deeper glance into the ext. aud. meat. could not be gained on account of the alterations present. Above all I emphasized the necessity of a free exit of the pus from the mastoid process by an external incision.

The mother said she would think it over, but did not return until June 4th. The boy's condition had in the meanwhile grown much worse, the flow of pus had almost wholly ceased, and violent headache set in, but *only on the diseased side ;* feverishness followed, and there were many attacks of chills, (the last one four days before) together with thirst and constipation.

Present State : Local condition the same as before ; pulse 84, temp. 38. The pupils were alike and movable. There was no organic trouble in the body except in the ear. The patient remained under my treatment and subsequent observation until Dec. 17, 1875. I quote the following abstract from the long history of the case :

Wilde's incision was made on the next day under chloroform, and the granulations described were removed with the snare. The bone was found to be very rotten. The thick-bladed knife ran deeply into it, and a large amount of thick, offensive pus escaped. The water injected into the mastoid process flowed easily through it, and then out from the ext. aud. meat. The probe when introduced towards the ext. aud. meat. touched upon rough patches. I could not demonstrate the mobility of a sequestrum that was possibly present. June 6th, the patient feels very well; temp. 37.4; pulse 80. Spontaneous defecation. Local state the same as yesterday.

The treatment in the following month was confined especially to a preservation of the communication between the two openings, and to nourishing food. This left nothing to be desired in so far as the general health was concerned: but on the other hand, the granulations in the ext. aud. meat. grew again luxuriantly so that by the middle of July, the purulent discharge from the ext. aud. meat. stopped once more, and the water syringed in at the mastoid process did not flow from the meatus, until the sound had been introduced into the openings in the bone. In order to relieve this state of things, the granulations in the ext. aud. meat. were again removed July 15th. The case continued now satisfactory, and August 21st, the patient was sent home with the needful directions.

September 30th, I saw him again for the first time. The granulations had indeed grown again, but without prejudicing the communication during syringing. They had also taken a position further outward in the ext. aud. meat., and on using the sound, a sequestrum, movable with much difficulty, was found behind them. An attempt at extraction, as well as another on October 14th, was unsuccessful. The patient went home again for a week; October 21st, the sequestrum showed itself much more movable, and I succeeded in extracting it.

The sequestrum, covered with numerous granulations of small-cell structure, was 13 *mm.* long, 1 *cm.* wide, 8 *mm.* at its thickest portion, and 5 *mm.* at the thinnest. The posterior wall of the aud. meat. showed an irregular opening, covered with luxuriantly granulated edges; the lower wall was bulged outward at two spots lying behind one another, and excessively granulated.

To-day, for the first time, we could view the memb. tymp.; its larger part lay in contact with the wall of the labyrinth; the lower and posterior quadrant and the anvil were absent; the stirrup was clearly seen in its isolated position.

Oct. 30th.—The patient was wholly cured with exception of a slight purulent discharge proceeding from the region of the memb. tymp., on account of which he remained under observation until the middle of December. Both openings in the bone had closed. The lower wall of the bony aud. meat. showed two bulging hyperostotic elevations. The mastoid process remained sunken. The general health was satisfactory, and whispered words could be heard at 10 *m.* I saw the patient for the last time in the summer of 1878.

In the case just reported, I have laid the main stress in the treatment upon the maintenance of the passage of the wound in the bone. For this reason I acted more passively, after this aim had been reached by Wilde's incision, even towards the granulations, the removal of which was only indicated and undertaken when a stoppage of the pus was threatening. It was indeed impossible to think of their radical destruction before the sequestrum had been removed. The favorable course, and the lasting cure which finally ensued, have justified the therapeutic treatment.

CASE 2.—*Purulent inflammation of the ear in youth with caries and necrosis in the mastoid process. Cure (?) Renewed acute inflammation several years later in the mastoid process, with formation of abscess and renewed necrosis on both sides. Meningitis, pyæmia. Cure.*

Gustave Herm, æt. 18, basket-maker, of Ketch, consulted me November 23, 1875. The patient suffered in his youth from a discharge in his right ear. Eight years ago a swelling appeared behind the right ear, and opened after a short time. Violent pains preceded the opening of the swelling, and the wound finally closed. The discharge from the ear continued, and small bones are said to have come from the meatus. Finally the discharge also stopped, and he became deaf in the right ear.

About ten days ago, as we learn, violent pains upon the right side followed a cold, and not only in the ear, but also on the *whole right half of the head.*

Present state.—There is a scar about 2 *cm.* long upon the sunken mastoid process, which is not at all sensitive to pressure, and shows no other alteration except the scar. The ext. aud. meat. is filled with a pale-red fluctuating growth, which can be passed by the sound in front and beneath ; backward and upward it is united with the corresponding walls of the meatus.

Diagnosis.—Abscess in the anterior and outer segment of the mastoid process.

Therapeutics.—The abscess was opened by a large incision, which gave exit to a large amount of pus without decided relief. The patient said that he would come on the next day, but did not report until December 2d, when he was driven to the clinique in a wagon. In the interval his condition had grown decidedly worse, He had had chills, the pains in his head became terrible, and spread out, not only over the *left half of the cranium, but also over the neck, the spinal column and the extremities.* The patient had also often been delirious.

Several large polypi were found to-day, filling the meatus at the point where the abscess had been opened. Since we already had here a case of meningitis (complicated, perhaps, with pyæmia). I sent the patient to the medical clinique of Dr. Friedreich, where he was treated (also intercurrently by myself) until he was discharged from the hospital.

Here follows an abstract of the history of the case, as kindly communicated to me by Prof. Fürbringer :

The patient entered December 2, 1875 ; for history see above.

Present state.—The patient is well nourished. There is an old scar behind the right ear, offensive pus in the ext. aud meat., and polypoid growths. He lies with his eyes shut, his mouth open, groaning, and answering only slowly and with difficulty. He is difficult to arouse, and feverish ; his pulse is strong, but not remarkably frequent. His pupils are alike, and moderately dilated. He has slight stiffness in the neck. His heart, lungs, etc., are free.

Urine ; 1018 sp. g., without albumen.

	TEM.	PULSE :	TEM.	PULSE :	
	Morning.		*Evening.*		
Dec. 2.	—	—	38.2.	88 :	Ice bags on the head. Three leeches behind each ear ; chloral. Ears syringed with 1 per cent. solution of salicylic acid.
Dec. 3.	38.4.	80 :	38.6.	80 :	

Dec. 4.	37.6.	84 :	38.4.	80 :	Salicylate of soda, 5 grams daily, in solution.
Dec. 5.	37.8.	88 :	38.6.	92 :	Little or no sleep, and very slight abatement of the pain. Groaning is almost continuous. In the urine, spontaneous phosphatic sediment containing many crystals of oxalate of lime. Frequent grinding of the teeth, probably from pain.
Dec. 6.	38.7.	88 :	38.8.	88 :	Chills. Neck stiff and painful.
Dec. 7.	38.2.	80 :	39.2.	76 :	Sensibility, etc., normal.
Dec. 8.	38.2.	80 :	38.8.	80 :	
Dec. 9.	38.2.	76 :	39.0.	80 :	
Dec. 10.	39.2.	84 :	38.0.	84 :	A fluctuating swelling has formed behind the right ear, in these last few days, and is now incised, evacuating pus, pulpy, reddish-brown masses, and a small sequestrum from the mastoid cells. The opening communicated with the ext. aud. meat., on syringing.
Dec. 11.	37.6.	80 :	39.2.	—	
Dec. 12.	38.4.	88 :	39.0.	84 :	Several granulations were removed from the ext. aud. meat.; but some still remained upon the carious patches (Sequestrum ?). General state is better. Memb. tymp. not visible. Perforation-sound, when the air is forced through.
Dec. 13.	36.3.	80 :	40.0.	88 :	Ice bags continually on the head. Sodæ Salic. Perfect cleanliness and syringing. Aqua laxativa. Chloral hydrate at evening.
Dec. 14.	38.8.	84 :	37.8.	88 :	
Dec. 15.	38.0.	80 :	39.2.	92 :	
Dec. 16.	37.8.	100 :	39.0.	92 :	
Dec. 17.	39.0.	88 :	39.0.	100 :	
Dec. 18.	37.4.	76 :	39.0.	88 :	
Dec. 19.	38.2.	84 ;	38.8.	80 :	Exacerbation of pain which continues with less fluctuation in its intensity. Pupils alike.
Dec. 20.	38.0.	— :	37.2.	88 :	
Dec. 21.	38.1.	96 :	38.0.	88 :	
Dec. 22.	38.1.	88 :	38.6.	92 :	
Dec. 23.	38.2.	84 :	38.2.	80 :	Stiffness in neck is less. Groaning and sighing almost continually.
Dec. 24.	38.3.	88 :	38.5.	92 :	
Dec. 25.	37.0.	88 :	39.0.	92 :	Left pupil wider than the right. Quinia 0.3, four times daily.

Dec. 26.	36.6.	80 :	38.4.	88 :	
Dec. 27.	37.8.	92 :	39.0.	92 :	
Dec. 28.	37.6.	— :	38.0.	88 :	No decided improvement. The secretion from the ear is less offensive. Quinia is omitted.
Dec. 29.	37.4.	80 :	37.8.	100 :	The wound on the mastoid process has granulated.
Dec. 30.	37.8.	92 :	38.6.	92 :	
Dec. 31.	38.0.	92 :	39.6.	96 :	The difference in the pupils is now present, now absent. Morphia 0.01, subcutaneously. Remarkable effect ; pain is slight.
1876.					
Jan. 1.	37.8.	88 :	38.4.	88 :	
Jan. 2.	36.8.	68 :	37.0.	76 :	
Jan. 3.	36.8.	72 :	38.3.	92 :	Sleep. Morphiæ Muriat. 0.01–0.015, subcutaneously daily.
Jan. 4.	37.0.	88 :	38.2.	80 :	
Jan. 5.	36.8.	72 :	37.8	104 :	Very deep narcosis Vomiting (effect of morphia?). No complaints.
Jan. 6.	37.2.	80 :	36.6.	80 :	
Jan. 7.	36.8.	72 :	36.2.	72 :	Great restlessness, with the head buried in the pillows. He gives no answers. Retention of urine ; catheterization.
Jan. 8.	36.2.	84 :	36.8.	68 :	
Jan. 9.	35.2.	72 :	37.2.	— :	
Jan. 10.	37.2.	88 :	37.0.	72 :	Blood and pus in the urine, the retention of the urine has ceased. General condition better, pains less, and he answered calmly.

From Jan. 11–15 there was no more fever, but the left pupil was continually wider than the right.

Jan. 16th.—Slight exacerbations. The paroxysms of pain are mostly brief. The irrigations of the ear were continued daily, and also the injections of morphia. The patient leaves his bed.

Feb. 5th.—Urine free and without albumen.

Feb. 17th.—Examination by Prof. Moos, who discovered in the bottom of the meatus a still immovable sequestrum, covered with granulations, some of which were removed. The region of the memb. tymp. still invisible.

Feb. 19th.—Same state. Both of the openings in the mastoid process communicate very well, no matter from which side we syringe.

Feb. 22d.—Feels quite comfortable. The communication is still present. The secretion is scant and without odor. There is no difference between the pupils. The patient was discharged at his own request.

After a purulent inflammation of the ear, with caries and necrosis of the mastoid process, had been present in youth, a new inflammation ensued many years later, in the mastoid process after a cold, first in the external anterior, and some time later in the external posterior segment, likewise with caries and necrosis. Meningitis and pyæmia were also associated with the inflammation of the ear. In this case also, the same treatment was adopted as in the former. Unfortunately the patient did not report again. It was impossible to speak of a cure at the time that he left the hospital. Nevertheless, so far as the sequestrum was concerned, if he had returned later I should scarcely have acted differently than in the former case. The cure of the severe complications, in spite of the long duration of the original disease, is to be considered very noteworthy.

CASE 3.—*Discharge from the right ear in youth, which had apparently stopped until about three months ago. At the time there was violent inflammation in the anterior segment of the mastoid process and the neighboring wall of the ext. aud. meat. Acute caries of the segment affected, as also of a part of the antrum mastoideum and the annulus tympanicus. Multiple formation of polypi at the lower and anterior wall of the ext. aud. meat. Enormous masses of so-called cholesteatomatous masses in the cavities affected by the inflammation. Threatening brain symptoms. Permanent cure, with a large cavity remaining, made up of the outer and middle segments of the organ of hearing. Loss of the anvil. Partial restoration of hearing.*

Johann Hauck, shoemaker, from Hasloch, Palatinate, æt. 29, consulted me Jan. 29, 1877. He had suffered from his youth until about twelve years ago, with a discharge from the right ear, without any especial annoyance. It had then nominally ceased. Three months ago, pain came on in the bottom of the right ear, spread gradually more and more outward and laterally, and gradually assumed a truly furious character, from which he had been unable to gain even the slightest relief by medical help at his home. The pain behind the right ear was almost entirely null. On the other hand, in the last four days, violent headache set in and spread out over the right half of the cranium, accompanied by repeated vomiting, loss of appetite, obstinate constipation, thirst, and fever.

Present state :—The patient looks very pale and suffering. Pulse 110, and rather weak ; temp. 38.6. Pupils unaltered. The outer region of the right mast. process looks normal, and is not sensitive to pressure or percussion.

Several granulations are present in the ext. aud. meat., close to the end of the first third, and at the anterior and lower wall, but they become plainly visible only when a reddish, soft growth, filling the region of the posterior and upper wall of the ext. aud. meat. is pushed aside with the probe. A more accurate examination proved that this growth, together with its coverings, was intimately connected with those of the corresponding walls of the meatus, and that it could be nothing else than a space communicating with the cells of the mastoid process filled with soft contents.

Strict diet was ordered ; senna in the morning, morphia at night. The granulations on the anterior and lower walls of the meatus were removed, and an incision made into the posterior swelling, when I was not a little surprised to find that without meeting with any resistance I could pass forward from 3-4 *cm.* with the knife in an oblique direction. A large amount of offensive pus escaped, also partly cholesteatomatous and partly more purulent masses, and the wall of the abscess fell forward in the form of a large polypoid swelling. Very decided but not quite perfect relief followed at once. In spite of large doses of morphia, the pains in the ear, in the head, as well as the constipation and vomiting, continued in the following days. It was not until Feb. 6th that a decided improvement appeared, together with the disappearance of the symptoms just mentioned.

After the incision had been made, onion-like scales of epithelium overlying one another, partly yellow or yellowish-white, and partly shiny, escaped daily from the cavity of the abscess, which, however, did not grow smaller. *Feb. 6th.*—I therefore removed a large portion of the polypoid and prolapsed wall of the abscess with the scissors, and then removed some really enormous collections of cholesteatomatous masses, partly with the forceps, and partly with a broad hard rubber spoon. After the wall of the polypoid abscess which still remained, had retracted, I reached with the probe into a cavity abundantly filled with granulations, and made up of the interspace belonging in common to the ext. aud. meat., and the anterior segment of the mastoid cells.

All the subjective symptoms now ceased as if by magic, but the patience of the patient, as well as my own, was still put to a severe proof. *For fully three weeks* these cholesteatomatous masses evacuated themselves *daily*,or were removed with the forceps: the last on Feb. 28th. About this time, diffuse, connected, and partially uneven hyperostoses showed themselves on the lower wall of the ext. aud. meat., while the granulated portions everywhere diminished at a later stage. After the perfect cure which ensued at the end of the first week in March, the following state was confirmed:

Destruction of the cells of the whole anterior segment of the mastoid process, together with the neighboring wall of the bony ext. aud. meat. in front, with the exception of a small portion united with the cartilaginous wall; also of the posterior segment of the annulus osseus, and the outer and lower bony frame of the antrum mast. We could push the probe 6 *cm.* forward in an oblique direction towards the medial wall of the antrum. The posterior half of the memb. tymp. and the anvil was wanting. The anterior half and the handle of the hammer was anchylosed with the wall of the labyrinth, and the stirrup was isolated. The patient could repeat with ease all words spoken at a distance of 6 *m.* Experiments with the tuning fork showed that the labyrinth had remained quite intact.

The patient in this same state, once more quite healthy and capable of work, reported twice at the clinique in the summer of 1877.

It is very unfortunate that I was unable to make a microscopic examination of the masses removed until they had lain for a long time in Müller's solution. I found no cholestearin, but only large polyedrical cells without nuclei, and only a few with nuclei.

The case just reported bears much resemblance to that which Bezold' published in November, 1877.* In its development also, it appears similar to the mode which Bezold has so clearly described. A purulent inflammation of the ear, which had been present in youth, was the starting point of the disease, for which the condition of the memb. tymp., as described, may serve as proof. A space of twelve years of perfect health filled up the interval between the cessation of the original outbreak and the renewed affection. New inflammatory symptoms then arose without special causation. The pain assumed the most violent character, and here is the point at which, as regards the interpretation of the symptoms, I would direct attention to a condition not stated by Bezold.

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* *Archiv f. Ohrenhlkde.* Band xiii, heft 1, pag. 26, *et seq.*

We cannot doubt but that the origin of the concentric masses of epidermis in the mastoid antrum even though their growth was latent during many years, was connected with the previous inflammation of the ear. Just as little can we deny a pressure-atrophy from the ever-increasing growth of the masses in the bony parts adjoining it, when we consider the products of the pathological anatomy.

How enormous these disturbances can be is proved, amongst others, by my own observations on the cadaver, which Bezold also cites. See ARCH. OF OPHTHAL. AND OTOL., Vol. iii, 2 p. 202, etc.

But in the end, indeed, a rapidly advancing osteoporosis and an acute caries in the outer and middle segment of the petrous bone associated themselves to the original disease. The abundant discharge of pus when the incision was made, and especially the extraordinarily violent character of the pain, are in favor of this view.

In regard to other circumstances, it is noteworthy in our case that the outer surface of the mastoid portion was without swelling, and on the whole quite free from alterations, and as insensible to pressure as to percussion.

This short clinical case goes to show that swellings and enlargements of the posterior wall of the aud. meat. are not so very rare. Still they are not absolutely trustworthy in a diagnostic point of view, as indicating the presence of a collection of cholesteotomatous masses. In such cases we may have to do with a real abscess of the mastoid cells, or even with a large cold abscess. An error in diagnosis, however, would be of subordinate importance in so far as therapeutics are concerned. We should always make an incision. But whoever reckons, under all circumstances, in meeting with decayed and incisible bone, will have many a disappointment to undergo.

The following case teaches much in this respect:

CASE 4.—*Purulent discharge from both ears in youth, which ceased until the age of twenty-four. At that time repeated attacks of violent inflammation in the left petrous bone. Formation of abscess in the anterior segment of the left mastoid process. Cerebro-spinal meningitis; pyæmic cystitis, and polyarthritis, followed by death. No post-mortem.*

Wilhelm Scharf, a shoemaker, æt. 24, of Helmstadt, consulted me May 10, 1878. The patient had a discharge from both ears when six years old, without any known cause. At a later date it ceased completely. He then remained healthy, and served as artillerist during the Franco-Prussian war. Three months ago he had renewed trouble with his ears. At this time he was attacked with pains in the left ear which lasted uninterruptedly for three days and three nights, and spread over the whole left side of the head. There was however no discharge, and an interval of five weeks of seemingly perfect health ensued. Seven weeks ago the same attack repeated itself with violent fever, again without discharge, and again with a pause, until within four days. Since this time the patient has had continuous pains in the left ear, but not in the left half of the skull, nor has he been feverish.

Present state.—Pulse 76, temp. 37. The right mastoid process is sunken on its outer surface and shows a scar about ½ *cm.* long. The vessels of the handle of the hammer of the right memb. tymp. are hyperæmic, the short process prominent, the posterior fold extremely developed, and the mucous membrane thickened. Hearing 1⅓ *m.* for Politzer's acoumeter. Hearing on the left side is null for air-conduction. All tuning forks are heard by bone-conduction on the painful side. The labyrinth, therefore, is free. The left ext. aud. meat. is completely filled with a white, compressible growth, which is painful on pressure, and lies in contact with the posterior and upper walls. The outer surface of the mastoid process is unaltered and is not painful to pressure or percussion.

Diagnosis.—Caries in the anterior segment of the mastoid process. I emphasized to the patient the gravity of his disease, and the necessity of his coming to Heidelberg to remain under my care. He said that he would talk it over with his family, and begged me in the meanwhile to treat him as an out-patient. I made an incision into the swelling of the ext. aud. meat., more blood than pus followed the incision, the swelling did not collapse, and on using the probe, I found indeed that the wall of the aud. meat. was rough, but I could nowhere find a communication between the abscess-swelling and the cells of the mastoid process.

May 14th.—The patient was free from pain until to-day, and therefore declared anew that he would not come to Heidelberg to stay. The local state had altered, in so far as the edges of the wound had assumed a granulated condition. The aud. meat. remained blocked up. Some thickened purulent secretion escaped from the wound. Sounding gave the same result as lately.

I ordered luke-warm irrigation for the ear and warm poultices.

May 21st.—Perfect health until day before yesterday, so that patient went to his work. Violent pains in the ears and in the temples had been present day and night since day before yesterday, but early this morning they abated. There is but slight discharge. The growth in the ext. aud. meat. is as before. The incision was repeated without causing any alteration. Patient was urged once more to come to Heidelberg, and remain for treatment, but all in vain.

May 28th.—The patient presented himself for the last time. He has now continuous and violent pains in the forehead ; his pulse is 130, and he has no appetite. There is much pus in the abscess in the ext. aud. meat., which is removed by pressure and with the hard rubber spoon. Probing gives the same result as before, and afterwards the patient feels much relieved. He was ordered the same treatment as before, and eventually ice bags to his head. Dr. Frey in Neckarbischofsheim, was summoned May 29th for advice by the patient's family, and communicated to me the following report of the further course of the case :

"The patient, whose consciousness was still perfect, told me that after Prof. Moos had treated his ear, he had been perfectly well ; while walking up and down the Heidelberg railroad depot, he had been attacked suddenly with dizziness and violent sickness, followed by vomiting. With full consciousness he then made his way into a neighboring restaurant, and later, in spite of violent pain and sickness he went by railroad to Helmstadt, from which place he could with difficulty reach the first station where his father was the keeper. His parents made cold applications for him throughout the night. I was called early the next morning.

The patient complained of very violent headache, tearing and lancinating pains in the extremities and in the back. The abdomen was drawn inward. While I was present he vomited several times; the pulse was very slow, temp. 39.2; the pupils reacting slowly, and his eyes were fixed.

There was also strabismus. The sensorium was wholly free. The muscles of the neck were drawn backward. A serous fluid mixed with blood flows from his left ear. The patient desires to lie on his back, with his legs and arms outstretched. All his other functions are normal.

Ordered Apperients, ice bags; some leeches to the left mastoid process, and at evening some doses of quinia.

May 30th—Symptoms are the same; temp. 38, but no vomiting. On using the ear-speculum we see a still larger flap at the place where polypoid growth is inserted, on moving which more blood appears. The mastoid process was not painful on forcible pressure.

The patient was very restless towards evening.

June 1st.—Condition the same; temp. 39.5.

June 2d.—The patient considers himself much better; temp. 39.2.

June 3d–4th. The same.

June 5th.—Retention of urine; the urine evacuated by the catheter contained pus. Chills: temp. 39.8; the sensorium much affected.

June 6th.—Same state.

June 7th.—Pyæmic inflammation of the hip joint, with very considerable exudation. Very violent pains in other joints. The lungs in front are free, but an examination behind was impossible on account of opisthotonos.

Ordered morphia injections on account of extreme restlessness.

June 9th.—The patient died. A post mortem was not allowed in spite of all our endeavors.

The explanation of the case before us is difficult. Until the patent came under my charge, the case resembles the former one in every particular. The disease of the ear in youth, its cessation for several years, the violent pains ensuing in the last three months, although step by step and with long intermission, suggested the possibility of a cholesteatoma causing inflammation by its growth. But both causes together did not succeed in penetrating or breaking down the bony posterior wall of the ext. aud. meat.

What did the swelling in the ext. aud. meat. mean? Was it the symptom of a simultaneously present periostitis, or of a cold abscess? Many points are in favor of the last assumption. Amongst others the rough condition of the bone on probing, the size of the growth remaining unaltered after the repeated incisions, etc.

I described a similar case in my autopsies of ear-disease. First series, ARCHIVES OF OPHTHALMOLOGY AND OTOLOGY, vol. iii.

In the whole course of the disease however, as well as in the state of the parts concerned, the way to treatment was clearly pointed out by nature herself, and this consisted in the attempt which was indeed not difficult to accomplish, to open the cells of the mastoid process from the ext. aud. meat. I could not make up my mind to operate unless the patient would remain in Heidelberg. But he could never be persuaded to come for more than from time to time to the clinique. It is doubtful, however, whether an operation would have saved his life.

ON BRANCHIAL FISTULÆ AT THE EXTERNAL EAR.

By Dr. D. SCHWABACH, of Berlin.

Translated by James A. Spalding, M. D., Portland, Me.

THE *Monatsch. für Ohrenheilkunde*, (No. 9. 1878), contains a notice of Pagets' paper "on branchial fistulæ at the external ear," read before the Royal Medical and Surgical Society (*Lancet*, Dec. 1, 1877), and doubts Pagets' opinion as therein expressed, that these anomalies are not so rare as is usually believed. The editor also "has never yet seen anything of the sort." If now, indeed, the number of cases cited by Paget from past and contemporary literature is small, his supposition that they are by no means so rare, is thoroughly established. Leaving aside the previously cited cases,* Urbantschitsch † has lately communicated his experience in twelve cases that he has observed, "of fistula auris congenita or alterations at the external covering corresponding exactly with its orifice." Since 1876, I have observed seven cases of this rudimentary development, and they seem to me to be so much the more worthy of communication, as they are well fitted to confirm the observations made by Urbantschitsch, particularly as regards their *hereditary transmission.*

The anomaly in question was found in four male and

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*Heusinger: Virchow's *Archiv.* xxix, 26. Schmitz: Ueber Fist. Aur. Cong., Inaug Diss, Halle a S 1873. Schede. s bei Schmitz. Pflüger; *Monatschr. für Ohrenheilkunde*, 1874. 11.

† *Monats. für Ohrenheilkunde*, 1877. No. 7.

three female individuals. In four cases it was present on one side only, in three on both sides. The situation of the rudimentary development in six cases was in front of the helix, at 2–3 *mm.* distance, and about 1 *cm.* from the tragus. In one case only did it have the form of a dimple as large as a pin's head, in the concha auris at the crus of the helix. In another case besides a shallow dimple at the usual situation in front of the helix, another one precisely similar was present in front of the first and about 5 *mm.* distant. As regards the form of these rudimentary developments, I found in six cases a mere dimple as large as a pin's head, and in one case only could I establish the existence of a genuine fistulous canal, into which the probe passed 5 *mm.* upward and downward, while forward and backward it could not be pushed further than the length of its head (2 *mm.*) In this case as in two others, a creamy fluid containing abundant pus corpuscles escaped from the fistulæ from time to time. In all these three cases, moreover, the rudimentary development was present on both sides, but in every case the secretion came only from one side. In two of these cases besides, a purulent obitis media was present in the very side from which there was a secretion from the fistula, and the individuals affected also believed that their ear affection stood in connection with these fistulæ. That this was not the case, was proved as well by examination with the probe, as by syringing into the fistulæ, neither of which procedures could demonstrate any communication between the fistula and the middle ear. In the third case, in which there was a secretion from the fistula, the organ of hearing was proved to be perfectly normal, so that in this case also it was impossible to imagine a connection of the fistula with the middle ear. Again, in another case, a dimple that had no secretion was found in a female patient with chronic otorrhœa (otitis externa) on the same side. No other anomalies could be discovered in the organ of hearing in the remaining cases. All these facts, but especially the circumstance that even in the cases with secreting fistula it was impossible to demonstrate their communication with the tympanum (as also in the cases cited by Schmitz and Pflüger) are in favor of the assertion made by Urbantschitsch (l. c.) and proved by embryological studies that the so-called fistula auris congenita has no right to such a title, and that it is simply to be regarded "as a remnant of the original branchial fistula which in the normal condition closes completely." Urbantschitsch had already proved in a former work* that the external and the middle ear do not in any way originate from the first branchial fissure.

Paget was also able to confirm by his own observation, the hereditary transmission of branchial fistulæ observed by Urbantschitsch in one of his cases. He found the fistulæ partly on one ear, partly on both ears in five children, their father and his sister. In my cases also, an hereditary transmission was repeatedly demonstrable. The following case offers the greatest interest :

Madame M., suffering from a chronic purulent catarrh of the middle ear with formation of polypi (right ear), offers on the same side and at the usual situation in front of the helix, a dimple as large as a pin's head, from which a creamy fluid containing abundant pus corpuscles escapes from time to time. A precisely similar dimple is found at the same spot on the left side, but without any secretion. The left ear is healthy. The patient informs us that her mother had, on both sides, one of her sisters and one of her children, on one side (she did not know precisely whether right or left) the same dimples from which, however, no secretion had ever issued. As I lately learned from the family physician, Madame M, has just given birth to a child, who shows on both sides at the helix, a dimple without any secretion.

Two other cases that came under my observation, were in brothers, one of whom, the elder (three years old) had on the right side a dimple as large as a pin's head, which had a purulent secretion from time to time, and on the left side a simple scar-like depression, while in the younger brother (one year old) I found on the left side only a superficial dimple without secretion. The parents of these children are free from similar anomalies. It was impossible to establish whether such had existed in the grandparents or other relatives. Finally, two cases in which such rudimentary formations were present in cousins, once on the right side and again on the left, might also be cited in favor of their hereditary origin. Here also nothing was known of a similar anomaly of development in the ancestors of these children; nevertheless, as Urbantschitsch assumes for his case, it might be indeed conceived "that in a previous generation of the families concerned, a fistula appeared, and after omitting several generations, showed itself again in later branches."

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*Ueber die erste Anlage des Mittelohres und des Trommelfelles," (Mittheilung aus dem embryol. Inst. des Prof. Schenck, in Wien ; Band 1, p. 1–20. 1877.)

ANALYSIS OF THE TONES INCLUDED IN THE SECONDARY NOISE OF AN INTERMITTING TUNING-FORK.

By Dr. E. BERTHOLD, of Königsberg.

Translated by James A. Spalding, M. D., Portland, Me.

WHILE examining my ear patients by means of the telephone,* which I have used since Easter of last year, I accidentally discovered that the higher twelfth and the third of the second octave sounded at the same time with the fundamental tone of the intermitting tuning-fork. I could not at first succeed, even with the greatest attention, in perceiving the remaining overtones. The noise made by the skipping spark is particularly disturbing during this observation. Since the overtones ensuing in the secondary noise of the intermitting tuning-fork are of themselves only weak, it need not at all surprise us that they were never observed by anybody before the invention of the telephone.

The noise of the skipping spark is indeed noticeably enforced by the telephone which is brought into conducting communication with the intermitting tuning fork, but the simultaneous strengthening of the overtones belonging to the fundamental tone of the tuning-fork, renders their perception still more easy. But they can only be more accurately investigated by the help of resonators. Professor V. Wittich was kind enough to allow me the use of the resonators in the physiological institute (for which I owe him my thanks) and it happened by a fortunate chance that the tone of my intermitting tuning-fork ($c^1 = Do_2 =$ 256 vibrations in the second) coincided precisely with the deepest tone of the series of tuned resonators that were at my service. I can so much the more assume as already well known, the description of Helmholtz' intermitting tuning-fork, as well as the Bell telephone which I have used, as they are the same instruments employed by myself for "the optical representation of the vibrations produced by the telephone."* I repeat merely that my telephone, instead of the so-called mouth-piece, has an attachment tube which can be fixed very conveniently in the auditory meatus like an otoscope. A Daniel's battery of four elements was employed to set the tuning-fork into vibration. The galvanic current of this battery was so strong, that one could hear the tone of the tuning-fork through the telephone, away into the third chamber. A rattling secondary noise could be distinctly heard in addition to the fundamental tone of the tuning-fork. When the telephone was brought closer to the ear, the tumult of this noise was disagreeably loud and hindered an analysis of its separate tones. But at some distance off and with the unassisted ear, two harmonic overtones, the twelfth, Sol_3, and the third of the following octive, Mi_4, could, by careful attention, be recognized in the noise of the telephone together with the fundamental tone of the tuning-fork. By the aid of the resonators we could also discover the remaining harmonic overtones of the fundamental tone of the tuning-fork, and especially distinctly, Do_4, Do_4, Sib_4 and Mi_5. The tones Sol_4, Do_5 demanded more attention, and Re_5 was the weakest of all.

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* See Verhandl. der Physiol. Gesellschaft zu Berlin, No. 6. Hartmann: "Eine neue Methode der Hörprüfung mit Hülfe electrischer Ströme."—Albert Wodke; "Ueber Hörprüfung." Inaug. Dissert. Rostock, 1878.—Berthold: "Das Telephon als Hörmesser." Vortrag auf der Natur Vers. in Cassel, 1878.

It is possible, however, that the resonators were not tuned in perfect harmony with the fundamental tone of my tuning-fork.† The individual tones of the globes of the resonators now made themselves audible to several observers simultaneously, when the funnel-shaped end intended for the

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[*] *Monatsch. für Ohrenheilkunde* No. 6, 1878.

[†] I suspect that the deepest tone of the resonators (c^1) in my series was tuned to 264 vibrations.

auditory meatus was closed with the finger, and the telephone brought nearer to the other opening of the resonator; the globe of the resonator then acted like a resonance chest. The tones Sol_3 and Mi_4 were again the strongest. The smaller resonator globes sounded already at a distance of several inches, but the larger ones, Do_2 and Do_3, had to be brought close to the attachment tube of the telephone, so that the volume of air inside might be set into co-vibration.

If the attachment tube was pushed a little way into the opening of a larger resonator globe, we succeeded sometimes in producing two simultaneons tones. After proof had thus been gained that the telephone, besides a rattling noise, also included the fundamental tone of the tuning-fork and the whole series of harmonic overtones belonging to the fundamental tone, the question was to decide at what situation the formation of the overtones occurred. It is well known that a tuning-fork by itself gives but one single tone, and includes no harmonic overtones. It is also impossible to look for the cause of their origin in the telephone. The only remaining supposition was, that the overtones observed must be included in the noise which originates from the skipping of the spark, and the regular dipping of the platina needle into the quicksilver cup of the intermitting tuning-fork. In order to prove this supposition, it was necessary to analyze this noise with the help of resonators, after the telephone had been switched off from its conducting communication with the tuning-fork. This investigation had to be carried on in the evening, at a time when absolute stillness reigned in the physiological institute. If the tuning-fork was placed on elastic rubber bags, so that the resonance through the table and floor was excluded, I did not succeed in hearing a single overtone without help of the resonators. On the other hand, if I used the resonators in this examination, I could hear Sol_3 and Mi_4 again very distinctly, and the remaining overtones somewhat weaker. In our observation of the weakest overtones we must guard ourselves from the error, to which we are so easily exposed, of not letting the resonator globe rest absoutely quiet in the external meatus. The slightest rubbing of the resonators against the fingers or the walls of the meatus, is quite sufficient to hinder the perception of the weakest overtones. But it is quite different, as we have seen before, when we supplement the same investigation with help of the telephone, in which even the weakest overtones are perceptible without any difficulty. The shade, therefore, of a tone cannot undergo the slightest alteration in its repetition by the telephone.

The next question which I sought to answer had reference to the intensity of the overtones. I wished to ascertain whether by interpolating any obstacles to conduction between the electric battery and the tuning-fork, the weak overtones could be made to disappear sooner than the stronger. I made use of a rheostat as an obstacle to conduction; the number of units of resistance at which an overtone fell out should be the measurement of its intensity. This experiment gave me no positive result. So long as the resistance to conduction was not great enough to annul completely the vibrations of the iron plate in the telephone, the ear, the most sensitive reagent to tones, could hear the collective overtones with help of the resonators. A reagent by no means so sensitive as the ear, an easily moveable gas flame, to which the vibration of the air in the resonator could be conducted,* showed, at all events, variations in the different overtones. The wave-lines of the flames from the resonators Sol$_3$ and Mi$_4$, when observed in the rotating mirror, showed the highest eminences of the waves, even higher than the resonator Do$_2$, which, however, coincided with the fundamental tone of the tuning-fork. It seems as if the considerable mass of air in the resonator Do$_2$ cannot be so easily set into energetic co-vibration. The resonators that were put into the weakest co-vibration, Sol$_4$, Do$_5$ and Re$_5$ did not show any visible wave-lines. The telephone, in direct conduction with the gas flame, gave, corresponding to the sum of tones and noises which it contained, an irregularly formed wave-line, which contained wave-hills with many summits, whereas the flame pictures of the whole series of resonators showed entirely regular wave-lines.

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* Helmholtz: Lehre von den Tonempfindungen. 3 Aufl. Beilage iii, pag. 583.

In concluding here my investigation I would also remark, that amongst the methods of observing the overtones, none offers for one who is unpractised so few difficulties as that by the telephone herein described. Even if we have no resonators, it is easy to succeed in finding from a large number of glasses or bottles, some which will easily correspond to and sound with one or another of the overtones. As this co-vibration does not at once cease when the glass has been removed from the telephone, we can, while carrying on this experiment, demonstrate to one standing at some distance away the proof of the presence of an overtone, as soon as we hand him the glass that is filled with an overtone.

In reflecting that the intermitting tuning-fork is used, not only for varying acoustic experiments, but also in later days to test the acuteness of hearing in ear patients, the knowledge of the tones included in the secondary noise of the tuning-fork might not be without some value.

A CASE OF ACUTE INFLAMMATION OF THE MIDDLE EAR, WITH INFLAMMATION OF THE MUSCLES OF THE NECK, AND FACIAL PARALYSIS OF THE SAME SIDE. RECOVERY. WITH SOME REMARKS UPON THE INDICATIONS FOR WILDE'S INCISION AND TREPHINING THE MASTOID PROCESS.

By Dr. D. B. St. JOHN ROOSA, of New York.

THE following case gave me so much anxiety on account of a difference of opinion occurring between very competent authority and myself as to the true significance of some of the serious symptoms, and as to the proper treatment to be pursued, that I report it, hoping it will be as instructive to my professional brethren as it has been to me.

May 5, 1879. Dr. S. æt. 43, a busy surgeon and medical journalist consulted me in regard to uncomfortable and painful sensations in his right ear. He was somewhat anæmic, jaded from overwork and he had an anxious appearance. He described the pain as extending from the right Eustachian tube to the drum, laying great stress upon the pain along the tube. The drumhead was red, the auditory canal normal. There was nothing marked about the pharynx. The hearing distance was not noted. Leeches were ordered to be applied to the tragus. I afterwards learned that he had slight nasal catarrh and headache with pain in right lower jaw on May 4. The next day I received a note from the patient stating that he did not feel able, on account of the pain, to come to my office, which was a very short distance from his. I found him in bed and apparently suffering very much. He complained of a pain like that from neuralgia, extending over the right side of the scalp, face, neck, the right auditory canal, and the Eustachian tube. Leeches and the hot douche were prescribed. The patient then told me that he had suffered a few weeks before very severely from facial neuralgia, that he then had no aural trouble, that he had had very lately an inflammation of the muscles of the opposite side of the neck. The membrana tympani was vascular but not bulging. Knowing that this patient had been very much overworked, with an insufficient quantity of fresh air, and seeing that he was pale and hyper-sensitive, I considered the pain as out of proportion to the objective symptoms of inflammation, and I therefore made a diagnosis of non-suppurative inflammation of the middle ear, with neuralgia of the fifth and seventh pair. In other words, I believed that the otalgic symptoms predominated over those of true inflammation. Warm applications behind and over the ear were advised as well as the use of the hot douche. The hot douche was not well borne, nor was there much relief except at short intervals, from these measures, It should also be said that I laid great stress upon maintaining the nutrition, and a generous diet was insisted upon. On the fourth or fifth day the auditory canal was somewhat swelled but not tender. I incised the drum-head, but no pus and no mucus were evacuated. The hot douche was now freely used and afforded relief. A very moderate suppuration occurred in the tympanic cavity, Morphia was administered, *pro re nata*. The patient sat sometimes out of bed, but did only tolerably well, complaining at intervals of very severe neuralgic pain which was relieved by morphia. He took nourishment badly except in the intervals of freedom from pain. He was very much depressed in spirits. There was no tenderness nor any other inflammatory symptom on the mastoid or in the pre-auricular region, On May 15th—ten days after I first saw the patient, I went out of town to fill a professional engagement, and my associate Dr. E. T. Ely took charge of the case until May 25th, and his notes are as follows :

" Dr. S. Seems to be a case of acute suppuration of the middle ear, with considerable swelling of the auditory canal, slight discharge, no pain. 16th more pain and swelling, no discharge. 17th severe pain in whole right side of face and head and in the ear, not controlled by douche, no discharge, funnel shaped swelling of the canal, not very tender. Consultation with Dr. A. H. Buck. It was decided to incise the canal and re-open the drum-head. This was done under ether. The opening in the drumhead was very free, and the canal was incised from the bottom to the entrance. Three leeches were then applied to the tragus and one to the mastoid. Hot douche was continued. No pus followed these incisions.

May 18*th.*—Pain most of last night. A little easier this morning. Discharge of pus beginning.

May 19*th.*—Comfortable until evening, then great pain in ear and head, temperature 101½°, three leeches to mastoid, douche, morphia. 20th not much pain; weak and depressed. A. M. T. 98½°, P. 88, P. M. T. 100½°, P. 88. Slept most of the day.

May 22*d.*—No fever yesterday or to-day, one attack of severe pain last night, canal red and swollen, free discharge since incision, four leeches applied, and hot douche for twenty minutes every two hours.

May 24*th.*—Pain part of every day, no fever, severe pain last evening quieted by morphia, slight mastoid tenderness and œdema last evening and this morning, less swelling in canal. Dr Buck was again called in consultation, he advised opening the mastoid by trephining. Dr. C. R. Agnew was called in the afternoon. He considered the case a typical one of mastoid disease of proliferous nature, but that no suppuration was going on there. He thought the disease was chiefly in the mastoid from the outset, and that there was meningeal congestion. By the ophthalmoscope the veins in the right fundus seemed a little fuller to Dr. A. and to Dr. Ely than in left. Dr. A. advised potass. iodide gr. x t. i. d., and increased to point of tolerance. Fld. ext. Ergot ʒ j. t. i. d. sodii bromid. gr. xv at night. Keep ear and mastoid warm with cotton, and omit douche."

May 25*th.*—Very slight œdema and some tenderness over mastoid, and although only one dose of the iodide was taken, iodism was produced. Patient was awake all night from sneezing, and had some pain in the other ear. He is nervous and hysterical, buries his head in the bed clothes, and refuses to be comforted. He expresses the belief that he will not recover. On this date I met a gentleman with very large aural experience, and we went over the case very carefully. The patient seemed to be suffering very much and he located the seat of his pain by spreading out his hands like a fan over the right side of the head. The tenderness about the ear was not very great, and was found in the neck and occiput as well. The ear was discharging freely with healthy pus. The mastoid was so slightly œdematous that I thought its condition might be due to the leeches and other applications. It did not seem to me to be a case of mastoid periostitis, nor did I think there was any meningitis or cerebral disease. Although I did not feel so sure of the former point as of the latter, I still thought the pain was neuralgic rather than inflammatory. Inasmuch, however, as Dr. Agnew had on the day before given the opinion that the mastoid was markedly involved, and that there was a meningeal hyperaemia, and as the gentleman now in consultation was much more decided in the opinion that the mastoid was the point of the origin of the pain, and moreover since my own judgment was a little doubtful and wavering, I advised that a Wilde's incision be made at once. If this incision failed to detect disease of the bone, I resolved to take no further operative steps at this time, although the gentleman in consultation afterwards stated to me, that he considered this but a step in the right direction, he believing that the bone should be opened, and that even if no pus were found, the bone fistula would do no harm. The incision was accordingly made, no disease of the bone was found. The wound was dressed to the bottom with lint, and a poultice was applied.

May 28th.—The pains in the head and neck are not at all relieved except when morphia is used in full doses. The tissues of the mastoid, pre-auricular region and neck were red, swelled, and tender at various points. These symptoms have increased since the incision. The depression of spirits continues, but at times the patient can be made quite cheerful by light conversation and after a dose of morphia. He is taking a moderate amount of stimulants, and milk very freely. Dr. William A. Hammond was called in consultation, his opinion was that there was no disease in the cranium, and that the pain was due to neuralgia largely modified by malaria. He advised that 60 gr. of quinine be given in twenty-four hours for two days, and that this treatment be followed up by small doses of arsenic. This treatment was followed by an apparent alteration of the pain, and not so much morphia was needed.

On June 3d the muscles of the neck were so much swelled that we pronounced them in a state of inflammation, and leeches were applied. The arsenic and generous diet, as far as patient would take it, with moderate doses of alcohol, were continued. The neck was especially tender where nerves made their exit. There was no especial tenderness on the mastoid ; the patient could scarcely move his head from side to side.

June 7th.—The conjunctiva and outside of lids of right eye are reddened ; the ability to close the right eye is impaired.

June 8th.—Conjunctiva and lids less red than yesterday. Slight enlargement of gland at the angle of the jaw on the right side. Severe pain in the jaw and mastoid region. Morphine was freely administered hypodermically for its relief. A poultice was kept on the side of the face and the head. T., 101½° ; P., 100.

June 9th.—Swelling at the angle of the jaw increased ; pain severe, and facial paralysis on the right side well marked. The right lid does not completely close in winking. The right side of the face appears rounder and fuller than the left, and the mouth is slightly drawn towards the left. The tongue protrudes in a direct line, and there is no deviation in the uvula. There is apparently no disturbance of the sense of smell. T., 99½° ; P., 94. Two leeches were applied behind the ear.

P.M.—Severe pain ; mx. of Magendie's solution every three hours (hypodermically).

June 10th, A.M.—T., 98¼° ; P. 100. Slept well ; took about 1 qt. of milk during the night. Facial paralysis increased. Ophthalmoscopic examination by Dr. Roosa. The appearance of the fundus is the same in both eyes, and nothing abnormal is seen in either. The ear discharges freely.

P.M.—Longer intervals of freedom from pain. No morphine since the 8th at 9 P.M.

June 11th, A.M.—T., 99½°. Swelling at the angle of the jaw diminished. No pain since June 10th at 9 P.M.

P.M.—Pain recurs ; not so severe. Chloral and bromide of sodium are given for its relief.

June 12th, A.M.—Patient slept badly. Pain returned in the old regions, the jaw, behind the ear, and over the right side of the head. T., 98¾° ; P., 94. Patient very much depressed in spirits. Morphia again administered. At 5 P.M. a consultation was held, at which were present Dr. Alfred L. Loomis, Dr. Henry B. Sands, Dr. Charles R. Briddon, Dr. W. M. Carpenter, and the attending physician, Dr. Roosa. After Dr. Roosa's statement that the pus was freely discharging from the auditory canal, and that in his opinion there was no retained pus in the bone, without claiming to decide the strictly *aural* points of the case, positively, the conclusion was reached by the consulting surgeons and physicians that the patient had no symptoms of intra-cranial trouble, that there was no indication for operative interference with reference to the mastoid process, or suppuration in any part of the neck; that supporting treatment was demanded. On the suggestion of Dr. Loomis the stimulant he was receiving was increased to 1½ oz. of whiskey every three hours, and pushed to 2 oz. as soon as it became evident that it did not disagree with his stomach.

June 13th—Patient feels very comfortable; has slept well, is taking 2 oz. of whiskey in a tumbler of milk every three hours, and has not experienced the slightest stimulant effect. Takes nourishment aside from the milk. T., 99° in the morning, 98¾° 6 P.M.; pulse, between 96 and 100. Patient also takes citrate of iron and quinine. At 8 P.M. patient again complains of severe pain. Morphia administered at 9.30 P.M. At 3 A.M. on June 14th he was seen by Dr. Ely on account of great pain. Morphia was given at that time and one hour later. At 8 o'clock the pain was still unrelieved, and the swelling about the angle of the jaw and the mastoid process was very much increased. Morphia was freely administered p. r. n., and a consultation was held at 1.30 P.M., at which three aural surgeons and one general surgeon were present. The following opinions were given: Dr. ———, an otologist, saw no indication for operative procedure, while he believed there was mastoid disease. Dr. ———, also an otologist, believed that the patient was suffering from mastoid disease, and that trephining should be performed at once.

Dr.———, aural surgeon, thought there was no serious internal trouble, that it was external, and that the patient was probably suffering from some kind of poisoning,—malarial? sewer gas? that no operation was advisable. The general surgeon thought that pus would be found somewhere about the stylo-mastoid process, and he thought that nature would relieve the patient by suppuration. He laid great stress on the continued application of poultices, and he was not in favor of operative interference to-day. Dr. Roosa adhered to his original opinion, that the patient had a moderate inflammation of the middle-ear, with great neuralgic pain, and that the swelling of the neck and facial paralysis may have been caused by the operative procedures already undertaken, and that trephining was not justifiable, but that it would be injurious. It was decided to continue the alcohol and to make the application of poultices very thoroughly over the neck and mastoid.

An examination of the urine on June 15th, gave the following result: Dark straw-color, acid, sp. gr. 1024, albumen in moderate quantity, casts 2, slightly granular, uric acid a little, pus a little, mucus a fair amount, oxalate of lime a little. June 15th. The ear is suppurating moderately. The drumhead is granular, canal moderately swelled, ear easily inflated by Politzer's method. The swelling in the course of the sterno-cleido mastoid muscle, and about the neck, seems to be increased, but the tenderness is not so marked. The symptoms point to abscess forming in the connective tissue, and in the muscles of the neck, and over the mastoid process. Dr. Roosa does not think there is retained pus anywhere in the head, or inside of the temporal bone. There is a particularly tender point, 1¼ in. in a direction directly backwards and a little downwards from the lobe of the ear. There is scarcely any œdema about the Wilde's incision. T. 99°. P. 100.

3 P. M. The swelling has begun to subside. Dr.——, a general surgeon who had seen the patient on the 13th, saw the patient this afternoon, and thinks it possible there is pus in the petrous portion of the temporal bone, and that the swelling may be due to a temporary plugging up of the communication of the tympanic cavity.

Dr. Roosa thinks there may be pus in the cellular tissue, but does not think that it is necessarily connected with the tympanic cavity. The treatment was continued.

June 16th.—P. 98. T. 99°. Patient slept well. Dr. Roosa opened the track of the Wilde's incision with a probe. The swelling and œdema in the mastoid process and about the angle of the jaw remained the same.

Another consultation was held during the day, at which there were present two general surgeons, two otologists, and Drs. Roosa and Carpenter. One of the surgeons expressed the opinion that the patient's general condition had improved since he last saw him, but he declined to express any opinion in regard to the necessity for operative interference with the ear. He believed it *possible* that the operations already performed, might have aggravated the symptoms. The other general surgeon inclined towards trephining the mastoid. This should certainly be done in his opinion if there is a probability that there is not a free opening from the mastoid cells into the tympanic cavity, and this was a point to be decided by the aural surgeons. One of the otologists thought the patient better and that no operation should be done. The other aural expert believed that the bone should be opened. Dr. Roosa stated that his opinion was unchanged, but that he had so much respect for the opinion of the gentleman who was so decided with regard to the necessity for an operation as well as for that of the one who was inclined towards it that he wished for further advice before he declined to open the mastoid. By agreement Dr. Robert F. Weir, who was for some years aural surgeon to the Eye and Ear Infirmary, and who is now surgeon to two general hospitals, was invited to see the patient independently and alone, at 9 o'clock this evening, without knowing any of the opinions that had been expressed until his own was formed. Dr. Weir gave the following opinion : that the disease is probably an inflammation extending down the external auditory canal in the angle close to the point where the facial nerve passes, and that it may perhaps involve the mastoid process. He is inclined to think it does not. There is no indication for surgical interference for the present. The general plan of treatment was therefore continued. June 17th. An examination of the urine made this day shows specific gravity 1020. and a well-marked trace of albumen. No casts. The general condition of the patient is improving, and the swelling about the neck is subsiding.

June 19th.—Patient is still doing well. Treatment has been continued.

June 21st.—Patient sits up and walks about, swelling of the neck nearly gone, no pain or tenderness, drumhead healed, hears the watch tick. The swelling, and redness of the neck reappeared for one day, while the patient was convalescent and alarmed him, but it passed away in a few hours. This was after the drumhead had healed. July 5th. Patient walks about, has been twice to the sea-shore, hears the watch one inch, facial paralysis improving under electricity. July 20th. A note from the patient states that he can hear the watch ten inches, the voice as well as ever, that his facial paralysis is gone, that he considers himself well.

Remarks.—I regret very much that the early notes of this case are not more full ; yet I think they are sufficiently so to give my readers a fair idea of the first symptoms. It is probable, however, that the mere recital has not conveyed to the minds of those who have followed it a full sense of its doubtful features. They were such that, taken in connection with the patient's high professional position, they gave me great anxiety lest I should omit to do my full surgical duty to the case. The more recent of the notes were taken stenographically by Dr. W. M. Carpenter, to whom the patient and I are indebted for intelligent and assiduous care.

The point to be settled during the course of the disease was this: Is there a hidden suppurative process going on in any part of the temporal bone which causes the pain, œdema, tenderness, cellulitis, myositis and paralysis of the facial? My answer to the question was, No. The severe paroxysmal pain did not arouse the suspicion in my mind that there was mastoid disease, because there was absolutely no well-defined tenderness, redness or œdema until leeches and poultices had been freely applied, and not until two paracenteses of the drumhead and very free incisions of the auditory canal had been made.

On the 25th day of May, when I saw the patient after an absence of ten days, there was certainly a moderate amount of œdema, and this led me, although I suspected it had been caused by the leeching, to advocate a Wilde's incision, especially as I then thought it a harmless procedure, and two otologists who had seen the patient with Dr. Ely thought the disease markedly involved the mastoid, although only one of them advocated any operative procedure. I now think that this incision was a mistake, and that to it we owe the increase of the inflammatory symptoms in the neck and the facial paralysis. Indeed I now believe, on a calm looking over of the case, that every operative interference, from my first paracentesis down to the Wilde's incision, was unnecessary, and that the traumatism needlessly aggravated the painful case. The key-note was struck in the proper management of the case, in my opinion, when the supporting, anodyne and anti-malarial treatment by means of milk, alcohol, morphia and quinine was vigorously entered upon.

I believe, furthermore, that the disease would have been more easily subdued if I had gotten the patient out of his house and by the sea-side before the graver symptoms set in. This I urged upon the patient and his friends, but without avail. It was simply a case of sub-acute, non-suppurative inflammation of the Eustachian tube and tympanic cavity occurring in an anæmic and consequently neuralgic and hysterical subject. That he was anæmic was not only noted by me at my first interview, but when Dr. Loomis was called in consultation he stated that he had noticed the doctor's anæmic condition for a year.

Neuralgic he certainly was, for he had barely gotten through with a severe attack of facial neuralgia when the trouble occurred in the ear. The character of the pain during the whole course of the disease was not that arising from deep-seated trouble in the middle ear, but rather of a disease like neuralgia, in which there is an intensity at different times, and which has intervals of complete cessation. It was sometimes easy to divert the patient by light conversation or an anecdote for quite a long time, and on some few occasions the use of water in the hypodermic syringe was followed by as much effect as the employment of morphia. Now, the character of a pain caused by a severe inflammatory action in the tympanic cavity or mastoid process is such that no physician who has seen much of it would attempt to alleviate it by any diversion of the patient's spirits or by a placebo. Only positive means such as local blood-letting or division of the periosteum, will subdue this. I have long since recorded my experience * that morphia alone will not mask the severe pain of an acute inflammation of the middle ear. As Von Tröltsch aptly says, an inflammation of the tympanic cavity is essentially a periostitis, and every surgeon knows of what little avail are drugs against the pain of this disease except when it occurs as a result of the deposition of syphilitic poison. It should have been said before that this patient had no syphilitic taint whatever.

I considered the patient to be nervous and hysterical, because he bore his pain very badly, and because he suffered from very great depression of spirits. It is not usual, in my experience, for a patient suffering from acute inflammation of the middle ear, to dwell very much on his prospects of recovery, or to be greatly depressed about his future. He is

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* Transactions of the American Otological Society, 1875, page 89.

generally so much taken up with the severity of his pain as to have room for nothing else. Then there was something in the history of the house in which the patient lived which I failed to impress upon some of the gentlemen who saw him with me, which led me to believe, as was once independently suggested by Dr. Noyes who saw him two or three times, that there was an element of blood poisoning in the case, perhaps from sewer gas. Two members of the family had suffered from acute aural disease a few months before, and an examination made by competent authority late in the course of the case, showed that there was an escape of sewer gas in the cellar. I do not know that any special significance is to be attached to the presence of albumen in the urine, but so far as it goes, it indicates a somewhat deteriorated general condition. In analysing the case, I come over and over again to the conviction that the operations did harm. That traumatism such as the patient experienced in the paracentesis, and in the very free subsequent division of the membrana tympani, and the free incisions in the auditory canal, and the cut down to the mastoid bone, might induce adenitis, myositis, cellulitis, and that facial paralyis might result from pressure upon the nerve as it makes its way out of the stylo-mastoid foramen, I think does not admit of a doubt. Certainly, there never was any evidence that the facial suffered any lesion until after it had left the cranium and tympanic cavity. Besides, the swelling and paralysis occurred at a point of time which makes it possible to believe that traumatism may have caused them. But, the crucial test of the correct diagnosis was in the results of the case. There was no escape of retained pus either from the mastoid or from the neck. It certainly was not pus which caused the serious symptoms. When they were at their height the discharge from the ear went on, but gradually diminished. And when the patient was fairly convalescent, and up and about the old swelling and redness of the neck reappeared for several hours. Besides it should be noted that no chill occurred during the progress of the case. This fact together with the clearness of the patient's intellect, gave me great encouragement when I was struggling against the opinion of a valued colleague who thought the patient was dying for want of an operation. Dr. S. was relieved after large doses of quinine at a time when the pain was intense, and when these seemed to fail, he was permanently cured after the full doses of alcohol advised by Dr. Loomis

I believe that I was the first in this country to formulate the symptoms which should lead to the prompt performance of Wilde's incision, and trephining the mastoid process. As bearing upon this discussion, I venture to reproduce these formulæ here.

* I.—The integument and periosteum should be freely divided over the mastoid in all cases in which there is pain, tenderness and swelling in the part.

II.—Such an incision should also be made whenever severe pain, referred to the middle ear, exists, and is not relieved by the usual means, *i.e.* leeches, warm water, etc.

III.—An explorative incision should be made when we have good reason to suspect the existence of caries and retained pus in this part.

IV.—The mastoid bone should be perforated after such an incision whenever the bone is found diseased, or a small fistulous opening should be enlarged. It should also be perforated when we have good reason to believe, that there is pus in the middle ear or mastoid cells which cannot find an exit by the external auditory canal.

I omit the fifth rule as it has no bearing upon this case.

As is well known, it is very difficult to formulate rules for operation which shall cover all cases. All rules must yield to peculiar circumstances. Still I think my first formula might be a little more guarded. I would now write "the integument, and periosteum should be freely divided over the mastoid, where there is pain, *chiefly referred* to this region as well as tenderness and swelling." When the Wilde's incision was made in this case upon my advice the pain was not "chiefly referred" to this part. But there was no particular tenderness, simply a very slight œdema which might have been due to the applications that had been made, so that according to the rule without altering it, the incision need hardly have been made in this case. The second formula, however, justified the incision fairly, and this, I think, should be modified. I would now write, instead of the second, "such an incision should usually be made whenever severe pain referred to the middle ear *constantly* exists, which is not even temporarily relieved by the use of leeches, warm water, morphia, quinine, etc." In the case we have been studying, the pain was referred to many parts besides the middle ear, and it was relieved for hours at a time by morphia, quinia and alcohol. I would not modify the third and fourth formulæ, for I still think that the bone "should be perforated when we have good reason to believe that there is pus in the middle ear or mastoid cells, which cannot find an exit by the external auditory canal." Everything turns upon the "good reason to believe," and I did not advocate, indeed I could not consent to opening the mastoid, because I did not think that we had "good reason to believe" that pus was retained in this part. I am in full accord with the great English surgeon, Sir James Paget, who, in his admirable lectures expresses many times his hesitation to perform any surgical operation, however trivial, that is not absolutely required. We have no right I think to perform operations to clear up doubtful diagnoses, if, in case the operation proves to have been unnecessary, the patient will be decidedly the worse for it. If we put ourselves in the place of our patients, what we may regard as a trifling thing, "a mere cut," will not be so esteemed. A mere cut, when unnecessary, may have the most serious consequences, and all the history and symptoms should be carefully weighed before even that is undertaken. Such care will never prevent prompt, rapid and thorough surgical interference when demanded.

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* Treatise on the ear.—Roosa. Page 424.

In teaching medical students, I have always found them when fully awakened to the dangers of *neglecting* certain diseases, to be more apt to do too much than too little, especially with the knife and active drugs. It is possible also, that the crying ignorance and neglect of the previous decades in regard to the treatment of aural disease has had a tendency to cause us who see many of the affections of the ear, to lean towards the side of surgical operations upon the drumhead and mastoid, a leaning no less dangerous to the cure of some cases, than was the steering towards Scylla or Charybdis to the safe navigation of ancient mariners.

THE HISTOLOGY OF THE INFERIOR TURBINATED BONES, AND OF THE TELEANGIECTATIC FIBROMATA ARISING FROM THEM.

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Translated by Dr. Richard C. Brandeis, New York.

(*With Plates I and II.*)

H. G., aged 17 years, female, presented herself at the clinique of Prof. Moos, on August 1, 1878, for treatment of a bilateral catarrh of the middle ear. In examining the nose, a large tumor, broad based, and about the size of a hazel-nut, was seen, situated on the anterior third of the inferior turbinated bone of both nasal cavities. The one on the left side projected towards the septum, and almost entirely occluded the entrance to the nasal cavity, so that it was impossible to apply the nasal douche. As the patient had not previously been aware of the existence of the tumors, nor of the fact that she had any nasal trouble, she could give no information about their origin or duration. The patient was robust, but short in stature, not anæmic ; her neck deformed by a diffuse goitre, and although she was, at the time of writing, 18 years of age, the menses had not yet put in their appearance. The condition of the heart was normal. Her general health, good, and with the exception of her deafness, there was no cause for complaint. On August 6th the left, and on October 9th the right tumor was removed by means of the galvano-caustic wire. The hemorrhage was trifling during both operations. The patient was very irregular in her attendance at the clinique for after treatment. On the 14th and 21st of November a few small granulations, located on the left inferior turbinated bone, were destroyed by means of the galvano-cautery, and on the 2d and 7th, of January, this year, the same thing was done on the right side. These proliferations were situated on the seats of the tumors, which had previously been removed, and were, therefore, thought to be recurrent growths. Since that time the inferior turbinated bones have been quite healthy in appearance, although the mucous membrane lining the middle turbinated bones and the rest of the nasal cavity has been hyperæmic throughout.

The tumors were ovoid in shape, of a fungous nature, and very dense in consistency. The surface, which was nearest to the septum, was covered with grooves and crypts. The surface of the left tumor, which was in apposition with the septum narium, was uneven and ragged, owing to the continuous pressure exerted upon it. Small fragments of bone were entangled in the basis of the tumors, which had been grasped and detached by the galvano-caustic wire ; thus a favorable opportunity was afforded for examing these neoplasms in connection with their entire matrix.

As the examination, by means of the microscope, revealed a few peculiarities, I deemed it desirable to subject the normal conditions of the tissues of the turbinated bones to a careful investigation before proceeding with the former.

An inferior turbinated bone, which was not injected, was cut off close to the crista turbinalis, immersed for a few days in a one per cent. solution of chromic acid and, after the bone was fit for dissection, hardened in alcohol; then embedded in liver. The entire mass was divided into 344 frontal sections, so that, taking into account a few useless ones, and such which were used for special examinations of the tissues, estimating the length of the turbinated bone at about 6 *cm.*, there was an average of six sections to the millimetre. Thus the distance of the preparations from either the anterior or posterior end of the bones could be accurately determined. These were colored with pilocarpin, and then enclosed, in the usual manner, in Canada balsam. Before proceeding with a description of the growths, I take the liberty of adducing a few histological points, which, I think, are not generally known.

In proceeding in the manner mentioned above, we secure some very satisfactory demonstrations, especially of the sections of the bone which is composed of a spongy substance, whose varied arrangement in its different parts precludes any detailed description. I will only add that, at a distance of from 22–24 *mm.* from its anterior end, the bone is divided into an upper and a lower half, which two parts are but partially united by a narrow strip of periosteum. This condition was also found about the middle of the bone, but at this point the appearance of parts may vary in different cases.

Large, bright interspaces (Fig. 1) are seen in the fine bony trabecular substance, which are filled with fibrous tissue containing pale lymphoid cells. In this fibrous tissue we generally find transverse sections of delicate vessels; longitudinal sections being but seldom found, which, according to this, and like the veins in spongy tissue, commonly course in a sagittal direction. The walls of the vessels are apparently composed only of the fibrous tissue, which is here more closely aggregated than elsewhere, in consequence of which the edges of the cut vessels are more deeply tinged with the carmine coloring-matter than the surrounding tissues. Traces of an undoubted endothelial lining were only visible in isolated spots. This is probably owing to the fact that the head, from which the turbinated bone was taken, had been immersed in alcohol for a length of time,

The diameter of the vessels varied from 0.033 to 0.22 *mm.* In order to reach the outer surface, they either perforate the bone or lie in recesses separated from the soft parts only by the periosteum. In the middle three-fifths of the turbinated bone, where the osseous structure contains the largest cavities, we find, in the vicinity of the vessels, large, round and polygonal, fatty, glistening cells analogous to the marrow-cells generally met with in the cancellous portion of bone.

Voltonini * was the first to call attention to this beautiful vascular development, and has described it in an excellent manner. For reasons which I will explain hereafter, and which are based upon microscopic appearances in the tumor before us, I must account for the vessels otherwise. Voltolini considers them blood-vessels, whereas I, with the exception of a central artery which will be described later on, have seen but a few vessels coursing in the bone; and am more inclined to consider the most of them as lymphatics. An attempt to discover a connection with the blood-vessels was not successful, but many of them terminated in a bright and sometimes fissure-like space, which the periosteum made it possible to recognize in close vicinity of the bone (Fig. 1, b). In connection with these there were fissures in the soft parts, especially in the vicinity of the veins, which extended into the glandular structure and the connective tissue surrounding it. The fact that these fissures were found in every specimen, and were particularly well marked in neoplasms, led to the inference that they were not incidental to faulty preparation, but were nothing more or less than lymph fissures and nuitritive canals, whose contents were taken up and carried on by the vessels of the spongy bone.

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* Address delivered December 15, 1876, before the Silesian Association for National Culture.

The great vascularity of the turbinated bones makes it certain that a considerable current of serous fluid passes through the walls of the blood-vessels and permeates the surrounding tissues. The canals spoken of, protected as they are by the bony structure from compression by the erectile tissue, are well adapted to conduce to a free passage of these fluids into the neighboring lymphatics, which lead to the deep facial glands. Another fact, which goes to prove that they were not blood-vessels, was the delicacy of their coats, which could not well withstand the cardiac pressure. Furthermore, the vessels found in the bone, which was enclosed in the tumors, were somewhat dilated, and, in spite of the fact that they had been severed by the galvano-caustic wire, quite empty; whereas the vessels in the neighborhood were full of blood-corpuscles, while the fragment of bone was surrounded by a considerable extravasation of blood (Fig. 2, b, e). Nevertheless, further examinations of well injected human turbinated bones will be necessary, in order to determine this point satisfactorily. A specimen taken from a calf failed to throw any light on the subject.

As far as the erectile tissue is concerned, it is well known that the most numerous venous spaces are found at the posterior extremity of the turbinated bones. A few of these are prolonged throughout the continuity of the bone, on the lateral as well as the medial side, to appear more frequently on the anterior extremity, without, however again regaining either the number or size which they possessed at their origin. When they are less numerous, the space remaining is almost entirely occupied by large mucous glands, as depicted in Fig. 1, which is copied from a frontal section, situated about 18 *mm.* from the anterior extremity.

The venous spaces are characterized by the formation of longitudinal processes, which project into their walls. This I first considered a pathological development in the tumors, but have invariably found it in all normal preparations. The vascular cavities thereby assume the most varied shapes ; instead of a round vein we find them kidney- or crescent-shaped ; sometimes even triangular or polygonal and occasionally even stellate. Under the microscope the processes of the veins, which were cut through, assumed a club-like form, or sometimes even looked like a button or mushroom. Occasionally they only projected from one side, but *in other cases they anastomosed from different sides of the cavity.* It is presumable that these protuberances, in connection with the frequent angular shape of the vessels, are able to occlude them more efficiently, in case of a contraction of the tissues surrounding the walls of the veins, than would be possible if the vessels had retained their ordinary circular form. The lymph fissures mentioned above extended into the clubed and cone-shaped excrescences. Although the minor surface of the veins was lined by an endothelium composed of minute cells, its outer coating consisted of a dense network, 0.02 to 0.1 *mm.* in thickness, in which elastic fibres predominated. These generally extended vertically along the calibre of the vessels, and when tinged with carmine assumed a dark color very similar to that of the periosteum. In some specimens I thought I recognized transverse sections of unstriped muscular fibres, but failed to see them in teazed preparations which had been saturated in a twenty per cent. solution of nitric acid. On the other hand, in these specimens, broad and narrow elastic bands came plainly into view, which provéd to be composed of single fibrillæ, and were situated between the well-known spiral-shaped fibres.

It is well known that only a few arteries, branches of the posterior nasal artery, traverse the turbinated bones. In the majority of the specimens I could only discover three or four arterial sections, whose innermost coating always appeared to be closely folded. An artery courses through the middle third of the bone, within the bony canal described by Luschka, and is, in some places, changed into an open furrow, inasmuch as its bony walls are sometimes deficient on the medial and at other times on the lateral side, and then only covered by the periosteum instead. The other soft parts of the turbinated bone, as well as a few glands, also pass through this canal, all enveloped by the layer of periosteum.

The glands of the respiratory part of the nasal fossæ (Fig. 1, d) are generally considered acinous. Nevertheless they are not really composed of vesicles, as many specimens would lead one to suppose, but assume the form of many of those muciparous glands which Kölliker * has mentioned in his description of the glands of the mouth. They are, consequently, composed of very tortuous tubules, provided with many sinuses and oblong buds, and lined on their inner surface with low cylindrical epithelium. Owing to their numerous convolutions they sometimes assume a circular, and at others an oval or tubular shape in the microscopic section. Perhaps B. Fränkel † alludes to a similar appearance in saying, that "the nasal mucous membrane proper (in contradistinction to that of the olfactory part), contains more highly developed glands nearly allied to the acinous type." The longitudinal diameter of these groups of glands sometimes reaches 1 *mm.*

In the anterior two-thirds of the turbinated bones, the mucous membrane is only a delicate, slightly corrugated covering of the remaining soft parts, while at the posterior end the folds are so thick that transverse sections have cornice-like projections and indentations. These are evidently only present for the purpose of increasing the surface of the mucous membrane whenever a considerable congestion makes it necessary.

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* Histology, 4th ed., pag. 352.

† Ziemssen's Cyclopedia of Path. and Therap., vol. iv, pag. 112, Germ. ed.

The periosteum and mucous membrane are united by a fibrous network which passes through the glands and vessels. The dark color it assumes when died with carmine, in contradistinction to the pale yellow hue of the connective tissue, as well as its wealth of elastic fibres, justifies the supposition that it is more nearly allied to periosteum than to mucous membrane.

In accordance with this Kohlrausch * describes the erectile tissue as lying partly in the periosteum and partly in the mucous membrane, whereas other authors say that it is limited to the mucous membrane alone. It would be more correct to consider glands and erectile tissue apart from the mucous membrane, and to describe them as between the periosteum and mucous membrane, as they constitute the greater part of the soft tissues (Lusckha, B. Fränkel).

There are no differences of opinion about the epithelium. All authors agree in describing it as of the ciliated variety, and for that reason I have not deemed it necessary to illustrate it by drawings.

The tumors were also placed in a 1 per cent. solution of chromic acid until the fragments of bone contained in them had become softened. They were then divided into sections, which were colored with a solution of picro-carmine. The main features were so much alike that the following description will answer for both: The greater part was composed of the anatomical tissues proper to the turbinated bones, which, however, had undergone some changes. With the exception of a small excavation on the inferior surface, into which there was a proliferation of tissue (Fig 2, between k and l), the bone was quite normal in structure. Some of the lymphatics in the lacunæ were dilated; the fibrous tissue which filled these lacunæ was denser and more marked. The veins, especially those running in a medial direction and below the bone, were considerably dilated and filled with blood; their walls were thinner, and the excrescence

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* J. Müller's Archives, 1853, pag. 149.

projected into the calibre of the vessels in the form of narrow strips. The lymphatics contained in the latter, as well as those in the partitions separating the different veins, were very noticeable (Fig. 2, l). There was also a decided atrophy of the glands, their diameters lessened, and separated by a dense infiltration, containing numerous small cells within its interstitial tissue. They were sometimes so diminished in size that only traces of them could be found (Fig. 2, v d). The number of the glands, more particularly in the left tumor, was decidedly less than in normal tissue, so that a destruction of entire groups of glands could be proven. At some points only traces or remnants of the glands could be discovered, while the excretory ducts were intact, and sometimes even dilated. At some distance from the bone, veins, surrounded with thickened walls, but not themselves dilated, were found. At the periphery of the tumor, in transverse as well as longitudinal directions, numerous newly-formed vessels were seen, all filled with blood and nearly reaching the periphery. In the outer zone there was an infiltration of small cells lying within a delicate fibrous tissue, and the interspaces of the vessels in the other parts of the tumor were filled by a stroma of closely aggregated connective tissue, in which the cellular contents were visible only in the thinner sections. A few deep fissures (Fig. 2, sp) extended into the neoplasm from the periphery, and had an epithelial lining composed of thin, spindle-shaped cells several layers in thickness, which also covered the surface of the tumors, where, in some places, it was in active proliferation, and about 0.19 *mm.* thick.

We had, therefore, to deal with a dilatation of the veins situated near the basis of the tumor, a destruction of the glandular structure, a development of granulation tissue, and the formation of deep fissures.

With the exception of those by Michel and Köster, of which I will speak hereafter, I failed to find any description of the microscopic conditions of similar growths on the anterior portions of the lower turbinated bones. These proliferations are generally classed as inflammatory hyperplasias of the mucous membrane. Virchow,* in his lecture on mucous polypi, with teleangiectatic alterations of the vessels, only speaks of those polypi found in the posterior portion of the nasal cavities, which often contain extremely dilated vessels. He considers it still a mooted point whether or not the vascular naso-pharyngeal polypi may occasionally be connected with the turbinated bones. The case of E. Neumann,* quoted by him, is also that of a tumor of the naso-pharynx. B. Fränckel,† after describing the mucous polypi, passes on to the sarcomata and fibromata, which generally take their origin in the periosteum, and are not seldom teleangiectatic, and refers to the above quotation from Virchow's works. Michel ‡ has removed from the nasal cavities of a number of patients affected with chronic catarrh, a series of small tumors situated on the concave surface of the lower turbinated bones.

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* On Tumors, vol. iii, pag. 462.

He described them as spherical, cylindrical or strawberry-shaped dense sessile nodules. Köster's microscopic description is: "They are, in their deeper layers, angiomatous, and in parts composed of an interstitial tissue made up of small cells. Long and broad tubes, lined with ciliated epithelium, extend into them from the surface. The acini are closely aggregated, and between them are numerous lymph corpuscles. In the substance of the growth the blood-vessels are so greatly dilated that they often appear like cysts. Diagnosis: angiomatous mucous polypi and muco-glandular polypi." This opinion agrees with that advanced by us above, with the exception of the statement that a new development of glandular tissue had taken place.

Nevertheless, opinions may differ whether the above described nodes—to use an indifferent term—are to be considered as inflammatory swellings or as tumors. The first examination apparently revealed a simple teleangiectasis of the erectile tissue, while, at other points, a hyperplasia of the connective tissue, a formation of new vessels and a dense infiltration of cells had taken place, changes which might be looked upon as the results of chronic inflammation. The supposed cause of the neoplasm was such, that it might be either an inflammatory proliferation or a tumor. The possibility of there being a disturbance of circulation in the erectile tissue of the turbinated bone, in consequence of the diffuse goitre, was suggested. The pressure exerted on the veins of the neck by the enlarged thyroid gland, might have impeded the current of blood in the facial veins, in the anterior internal maxillary vein as well as the posterior nasal veins, and thereby given rise to a persistent venous stasis in the region of the turbinated bones. If this solution be not satisfactory, the cessation of the menses, which, as is well known, may also cause congestion in other organs, might suffice to explain the hyperæmia of the tissues of the nasal cavities.

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* Virchow's Archiv, vol. xxi, pag. 280.

† Diseases of the Nasal Cavities, Ziemssen Cyclopedia, Germ. ed., vol. iv, pag. 156.

‡ Diseases of the Naso-pharyngeal Cavities, Germ. ed., pag, 106.

In consequence of Cohnheim's investigations, it has become doubtful whether venous stasis or fluxion, even though long continued or often repeated (O. Weber) can give rise to a proliferation of tissue or, as Billroth says, whether "continuous stasis of blood and lymph, as well as coagulation of these fluids in the vessels cause hyperplastic processes in the walls of the vessels and afterwards in their immediate surroundings." But then again, the erectile tissue possesses certain properties not peculiar to ordinary veins, and it may be said that the walls of its vessels, which are permanently dilated, will, sooner or later, undergo changes of nutrition admitting a filtration of the fluid and cellular inflammatory material. The inflammatory condition of the skin in the vicinity of varicose veins, on the lower extremities, is a well-known example. We, therefore, consider ourselves justified in maintaining the correctness of our opinion as to the etiology of the enlargement, although it does not determine whether it be an intumescence or a tumor. It may be well to call attention to two facts which are in favor of a conversion of the inflammatory neoplasia into a tumor, *i.e.*, the atrophy of the glands, and the condition of the epithelium.

The destruction of the glands may be attributed to various causes. The proliferation of connective tissue may have given rise to cicatricial contraction, and thus have destroyed the glands lying in this region, by compression, in the same way as in the atrophic form of chronic rhinitis, in which the pathological alterations noticed in ozœna have occurred (E. Fränkel*). The unhindered formation of new vessels, as well as the enlargement of those already in existence, and of some of the excretory ducts of the glands militate against this view. On the other hand, the dilatation and formation of the vessels, and the pressure exerted by them may be considered as a cause of the wasting away of the glands. The development of the placental decidua, in which, at about the fourth month of fœtal life, there is an atrophy of the glandular structure, might be cited as a physiological paradigm. After all it is most probable that the cellular infiltration within the glandular interspaces produced the atrophy of the efferent ducts either by pressure or by absorption.

We must now return to Virchow's statement,† that tumors are generally found where permanent disturbances exist in the anatomical structure of the parts, which check the restoration of a healthier condition; keeping up an irritation, which in any other organ would only give rise to an inflammatory condition, but here becomes the starting point of a neoplastic growth. Cicatricial tissue is a good example of this condition of things, for it is well known that this is not infrequently the matrix of certain tumors. It is self-evident that the foregoing process must, in a short time, lead to a disturbance of the physiological equilibrium of the component parts of any organ, in consequence of which the chemical process of nutrition must necessarily be changed. We are, therefore, justified in assuming that, in our case, after the suppression of the function of the glands, the material ordinarily excreted by them was used, either for the further development of the neoplasm, or at least contributed to increase the chronic irritation already existing in the nasal tissues. This irritable condition soon extends to the epithelial lining, and here we find the second factor, which conduces to the development of a tumor, *i. e., the condition of the epithelium and the fissures* created by it. The result is, not only a proliferation near the surface, with a gradual exfoliation of the external layers, but what is more important, the chronic state of irritation gives rise, even in benign tumors, to an inversion of the epithelial growth, an expansion into the substance of the tumor itself. This is either in the form of the well-known cones, or, as I think is more frequently the case, the epithelium occupying the surface in large patches works its way into the growth, at first forming septa, and later on, fissures, as has so often been observed in aural and nasal polypi.

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* Virchow's Archiv, vol. cxxv.

† Tumors, vol. i, pag. 84.

Steudener * was the first to illustrate and describe this condition satisfactorily. He showed that the presence of glands could not be demonstrated when such fissures and grooves were present as soon as similar grooves were found in numerous successive microscopic sections. This author properly says, that heretofore but little attention has been paid to this peculiar condition of the surface of the polypi. He also says that " for this reason such epithelial proliferations can only be classed as glands when proper sections demonstrate them as real tubules which are lined with epithelium."

Based upon these statements, I would like to mention the observation that *parts of polypi are frequently detached by epithelial proliferation.* We then see a solid plaque of epithelium, which in a microsopic section looks like a narrow strip, proliferating towards the centre, and again reaching the periphery either directly or by means of lateral projections, thus encompassing segments of the tumor. The same condition may ensue, inasmuch as another proliferation of epithelium may approach the first from some other part of the tumor, and gradually unite with it. The type of epithelium is not of much moment. The process so well known in the embryonal development of the glands soon sets in ; in the middle of this strip the innermost layers of cells are separated one from the other, a fissure is formed, and the detachment of portions of the tumor, as described above, is the result. Such are often found on examination of polypi during the preparation of microscopic specimens, inasmuch as club-shaped protruberances become detached while making the sections. Occasionally we may succeed in securing them still in connection with the main portion, and can thus place them upon the microscopic slide. The strangulated portion is then found to be attached to the main portion of the section by a thin layer of epithelium. Fig. 4, representing a fibrous nasal polypus which I removed from the lower turbinated bone of a woman by means of an ecraseur, illustrates such an epithelial separation. The detached portion is here seen to be surrounded by epithelium, and only loosely connected with the main parts of the polypus. In Fig. 3, a section taken from the right nasal tumor, which has been the subject of this description, we can see the fissure so far developed that the portion shown is only attached to the main body by a slender bridge. It is probable that the lobes and nodes found on the surface of many benign tumors are not the result of a simple proliferation of the underlying tissue, in which case the epithelial covering would remain inactive, but are the result of an active and destructive invasion of the latter into the stroma of the growth.

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* Archiv. für Ohrenheilkunde, Bd. iv, pag. 205.

Herewith the question of the return of the epithelial coats to embryonal conditions, their struggle with the formations of the mesoderm (Thiersch *), (Boll †), which heretofore has been discussed principally in connection with the investigations of malignant growths, will also apply to growths of a more benign character. We cannot, however, deny the fact, that the most recent embryological investigations do not seem to corroborate these deductions. If it should be proven that the mesoblast arises from the epiblast (Kölliker), that epithelium as well as connective tissue may be either of the three blastodermic membranes, the independence as well as the struggle of one system with another would again be an object for future investigation. Nevertheless, the observation of many pathological conditions seems to favor such contradistinctions, the true explanation of which will require further investigations.

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* Epithelial cancer, especially that affecting the skin. Leipzig, 1865.

† The law of growth. Berlin, 1876.

Returning to the neoplasms under discussion, I must date the transition of the products of chronic inflammation into the development of tumors from that moment at which the condition of irritation (after a suspension of the physiological equilibrium by destruction of some component parts) was extended to the epithelial layer, and stimulated this to perverted action. Considering the tumors as teleangiectatic fibromata would correspond to the nature of their structure.

Prof. Moos, having kindly placed the material for these investigations at my disposal, is entitled to my heartfelt thanks.

Description of the Illustrations.

Fig. 1.—Hartnack, Syst. 2. Eyepiece, 3. Tub., O. Frontal section through bone and soft part of inferior turbinated bone, 18 *mm.* from anterior extremity.

a. Lacunæ in the bone, containing the lumina of the lymphatics (*l*).

b. Clear space between periosteum and bone. At *b* there is the terminus of a lymph-vessel.

k. Sinus in the bone.

at. Section of arteries.

v. Veins.

Fig. 2. Hartn., Syst. 2. Eyepiece, 3. Tub., O. Transverse section through the left tumor. In the section of bone whose apex extends to *kc.*, we find the same anatomical relations as in Fig. 1, but here the lymphatics are sometimes larger. Lower down there appear the cross-sections of numerous venous cavities, greatly dilated and filled with blood corpuscles.

ls. Lymph-fissure within the sinus of a vein.

vd. Atrophied glands.

sp. A fissure.

b. e. An extravasation of blood.

Fig. 3.—Hartn., Syst., 4. Eyepiece, 3. Tub., O. A portion of the right growth containing a fissure (*sp*) due to a sinuosity of the epithelium.

FIG. 4.—Hartn., Syst., 4. Eyepiece, 3. Tub., O. Transverse section through a portion of a lobulated nasal polypus, with a complete separation of a portion of the growth owing to epithelial proliferation.

ABSTRACT OF AMERICAN OTOLOGICAL LITERATURE FOR THE SECOND QUARTER OF 1879.

By SWAN M. BURNETT, Washington, D. C.

1. *A case of ear-cough. By W. S. Bowen, M.D. Boston Med. and Surg. Jour., June* 19*th.*

A girl of 8 years had been subject to a dry, and at times very distressing cough, for nearly two years and a half. For some reason, which the author does not state, the ears were examined and the right ext. meatus was found filled with inspissated cerumen. This was removed and a large jet bead found in the interior of the mass. There was some ulceration of the dermis near the *M. T.* In ten days the cough had entirely disappeared. The reflex action took place through a branch of the auriculo-temporal branch of the fifth pair, the connection with the other nerves being made at the floor of the fourth ventricle.

2. *The importance of treatment of the naso-pharyngeal space, tonsils and uvula, in acute and chronic catarrh of the middle ear. By Lawrence Turnbull, M.D. Rich. and Louisv. Med. Journ., April.*

Dr. T. first explains the best methods of examining the parts in question and then proceeds to the consideration of acute catarrh. His treatment consists in determining, as much as possible, to the skin and keeping the patient in-doors. As an agreeable snuff in acute and subacute nasal catarrh, he uses : morph. hydrochlor. gr. ij ; acac. pulv. ʒ ij ; bismuth. subnit. ʒ vi. A pinch to be used every six or twelve hours.

In the chronic form of nasal catarrh the most important matter is the removal of scabs and the irritating secretions. To accomplish this he uses warm solution of chloride of sodium, potassium or ammonium, thrown up the nose by means of an atomizer. No mention is made *pro* or *con* of the nasal douche. If the parts are dry, he uses the following solution warmed: Ammon. chlor. gr. iv–xij; aq. dist. ℥ i.

Internally, he has found cubebs of value, in doses of fifteen or twenty drops of the oleo-resin on sugar three times a day.

In acute tonsillitis, he applies nitrate of silver in substance followed by a gargle of chlorate of potash, or by the spray of a warm solution of twenty grs. of sulphate of copper to the ounce of water, with ten drops of carbolic acid added. If an abscess seems inevitable he punctures and thus cuts short the process. In the enlarged tonsils of children he rarely abscises, finding scarification and the application of absorbents usually sufficient, but in adults, (after 16 yrs.) he always removes a portion of the indurated gland before making local applications. Five cases in illustration are given.

3. Dr. W. W. Seely in some clinical remarks in *The Cincinnati Lancet and Clinic*, June 14th, said that so far as he knew, nothing applied to the ear afforded greater relief than a *poultice*, and in *acute otitis media purulenta*, heterodoxical as it might appear, he did not hesitate to use it now and then. In the same lecture he states that for the last decade he has used exclusively the application of chromic acid to all forms of *aural polypi*, with the most gratifying results. He has also ceased using *the syringe* in *otorrhœas*. He cleanses the ears with cotton wrapped around a No. 3 or 4 Bowman probe.

4. *Medication of the middle ear through the Eustachian tube, without the use of the Eustachian catheter—Etherial solutions. Dr. Luis F. Sass. N. Y. Medical Record, April 5th.*

At a meeting of the surgical section of the N. Y. Academy of Medicine, Dr. Sass exhibited an improved steam-atomizer, and described his method of medicating the middle ear without the use of the catheter. This is as follows: He fills one nostril with a bulb, to which the spray tube is attached; the other is closed by the thumb of the operator. The patient is then directed to fill the lungs and close his mouth. The spray will then enter the middle ear, and be seen to come out if there is a perforation. He has used the vapor of etherial solutions of iodoform and carbolic acid with satisfactory results. In some cases he has blown pus into the external meatus, after he had perforated the *M. T.* by means of this precedure.

5. *The limit of perception of musical tones by the human ear. Laurence Turnbull, M.D. Boston Med. and Surg. Journ. May 29th.*

Dr. T. employed in his experiments König's rods, and found among twenty-five persons, from 20 to 50 years of age, the highest limit to be 60,000 vs. There was often a marked difference in the two ears, generally in favor of the left. A young man of 26, however, went as high as 60,000 in his right, could only reach 55,000 in his left. Dr. T. thinks he finds a gradual shortening in the range of audition with age. He is also of the opinion that the education of the ear has much influence on the acuteness of hearing, and that by practice one can learn to distinguish tones that were before inaudible.

6. *Pathology of peripheral nerve-disease, by Julius Althaus, M.D. Amer. Journ. Med. Sci., April.*

Dr. Althaus devotes the second section of his admirable article to the consideration of *auditory neuritis.* He thinks it advisable to restrict the term "Ménière's disease" to those cases where there is evidently hemorrhage into the labyrinth, since most of the cases reported by the distinguished French artist were undoubtedly of that character. But there is another set of cases where the trouble is sudden in its onset, not very severe in character, and transitory. These he considers due to hyperæmia of the labyrinthine vessels. He also believes, firmly, in an idiopathic inflammation of the labyrinth, and that the inflammatory process may be propagated to the labyrinth from the brain and middle ear ; and thinks that such labyrinthine inflammation is frequently confounded with congestion or inflammation of the brain, or even with severe attacks of dyspepsia and conjestion of the liver ; and is much more common than it is usually thought to be. He then gives the history in minute detail of a case of what he considers to be labyrinthine neuritis in a case of locomotor ataxia under his care. The history in brief is as follows : A man of 32, previously of good health, had gastric troubles for some time, which were followed after some months by slight paralysis of some of the ocular muscles, and which disappeared in a few days. Shortly afterward there was vertigo, tinnitus and nausea, but no loss of consciousness. Gradually his hearing power left him, and he was completely deaf, not being able to hear the loudest sounds ; no bone conduction. Some reaction to the electric current on the part of the auditory nerve. External and middle ear perfectly normal. No dyscrasia of any kind. The usual symptoms of locomotor ataxia. Upper extremities not affected. One day the patient was taken suddenly with vertigo, followed by coma, and for two days there was an elevation of temperature, coated tongue and tenderness in the right hypochondrium. This passed off in a few days, and from that time on he steadily improved, and was finally discharged able to walk three or four miles and attend to his business. The deafness and tinnitus, however, remained as before. Before the last attack the treatment was nitrate of silver, hypophosphite of soda and podophyllin, and afterwards it was liquid ext. of ergot in half drachm doses three times a day, pushed to one drachm. After three months this was changed to citrate of iron and quinia. Dr. Althaus looks upon this case as one of acute inflammation of the labyrinth. The lesion could not have been at the cerebral centre of audition, because, in that case other nerves. notably the fifth pair, would have been implicated ; the auditory nerve itself was not affected, as he judges by the fact of its responding to electorial irritation ; it must, therefore, have been *per exclusionem* in the labyrinth. The second attack of vertigo and nausea he considers as due to a hemorrhage into the labyrinth.

REPORT ON THE PROGRESS OF OTOLOGY.

IN THE FIRST HALF OF THE YEAR, 1878.

IV. PATHOLOGY AND THERAPEUTICS OF THE ORGAN OF HEARING.

By A. HARTMANN, of Berlin.

Translated by Isidor Furst, of New York.

General.

1. Statistische Uebersicht über die vom 1. Nov. 1874 bis 1. Nov. 1877 in der Berliner Universitätspoliklinik für Ohrenkranke untersuchten und behandelten Kranken, nebst Bemerkungen zur practischen Ohrenheilkunde. [Statistical Review of the Patients examined and treated at the Policlinic for Ear Patients of the University of Berlin, from November 1, 1874, to November 1, 1877; with Remarks on Practical Otology.] By Prof. A. Lucae. *Arch. f. Ohrenheilkde*, Bd. xiv., p. 120.

2. Dritter Bericht aus der Privatheilanstalt f. Augen-und Ohrenkranke in München. [Third Report of the Private Ophthalmic and Aural Institute at Munich.] By Dr. Bezold. *Münch. Aerztl. Intelligenzbl.*, Nos. 44 et seq., 1878.

3. VII. Anno di Insegnamento della Otojatria. [Seventh Year of Instruction in Otology.—Statistical and Clinical Observations on the Scholastic Year 1877–78.] By Prof. E. de Rossi. Rome, 1878.

4. L'otologie dans les dix dernières années. [Otology in the last Ten Years.] Continuation. By Dr. Guerder (Longwy). *Annales des mal. de l'oreille*, etc., tome iv, No. 6.

5. De l'influence du tabac, etc. [On the Influence of Tobacco on the Development of Diseases of the Ear and Impairment of Hearing.] By Dr. Ladreit de Lacharrière. *Ibid.*, tome iv, No. 4.

6. Zur Casuistik der traumatischen Erkrankungen des Gehör-

organs. [Clinical Contribution to the Traumatic Affections of the Organ of Hearing.] By F. TRAUTMANN. *Arch. f. Ohrenhlkde.*, Bd. xiv, p. 113.

7. Noises in the Head; their Etiology, Diagnosis, and Treatment. (Continuation and Conclusion.) By E. WOAKES. *The Lancet*, July and September, 1878.

8. Zur Otalgia intermittens. By R. VOLTOLINI, *Monatsschr. f. Ohrenhlkde.*, etc., No. 7, 1878.

9. Vortrag über einen Beleuchtungsapparat des Kehlkopfes und der Gehörorgane und zu den daselbst auszuführenden Operationen. [Lecture on an Illuminating Apparatus for the Examination of the Nose, the Naso-pharyngeal Cavity, Larynx, and the Organs of Hearing; and for the Operations to be Performed thereon.] By DR. SCHALLE, of Hamburg. Naturforschervers. Kassel.

10. Day-Schools for the Deaf and Dumb. *Brit. Med. Journ.*, September 14, 1878.

1. Since the opening of the policlinic for ear-diseases at the University of Berlin, 2,388 patients came under observation, with 2,566 different forms of disease: affections of the external ear, 477; of the middle ear, 1,949; of the inner ear, respectively nervous deafness, 140. To the statistical compilation are attached remarks on the manner of conducting the examinations which are referred to in the report on physiology (see last number).

Of special cases are mentioned: three of aspergillus in the external auditory meatus; a case of bilateral congenital occlusion of the ear, with accompanying caries of the petrous bone. Among the latter, the fatal termination in one patient occurred by thrombosis of the sinus; there was no autopsy. In a child, a previously existing facial paralysis disappeared after scraping out the mastoid process with the spoon. Six months later, a sequestrum of considerable extent was removed.

Of particular interest is a case of epithelial carcinoma developing after repeated removal of polypi. By an operation performed by Bardeleben, exsection of a swelling the size of a cherry, temporary relief was obtained. Three months later, ulcerating swellings had formed in the neighborhood of the ear. Hectic fever, violent pains. Death nine months after first presentation.

In pulsating subjective noises in the ear, Lucae had excellent results with hydrobromic acid (15 to 20 drops in concentrated sugar-water, three times daily). Condensation of the air in the external auditory meatus was applied besides, with temporary benefit. Finally, a case observed by Dennert is communicated : after a cold drink, there was an attack of convulsions with succeeding disturbance of hearing and speech. Cure after exhibition of potassium bromide and the constant current.

2. Bezold's report, extending over a period of three years, contains, besides the statistical classification of 1,021 cases of disease, the discussion of some affections. The scarlatinous otorrhœas of children were cured, when early brought under treatment, by cleaning with salt-water and Politzer's experiment. Otomycosis came under observation thirteen times ; including his earlier cases, the author has treated the affection thirty times ; in fourteen of these cases, the fungus-formation occurred entirely without any symptoms ; in four cases, a reactive inflammation followed the removal of the fungous masses from the auditory meatus. Perforation of the membrana tympani was present six times. As cause of the fungus-formation the author considers instillations of oil which had taken place in twenty-four cases out of twenty-seven. Four deaths were caused by chronic otitis media purulenta ; in two, destructive osseous processes in the temporal bone were demonstrated during life, while in the other two cases polypoid proliferations only had shown themselves in the depths of the external auditory meatus. The possibility existing in cases 3 and 4, of prolonging life by an operation, is not discussed by Bezold. Of particular interest is another case of cerebro-spinal meningitis. The patient in question during the disease could no longer hear words pronounced with very loud voice, but perceived a tuning-fork placed on the vertex. Objective examination normal. The almost complete deafness was accompanied by strong tinnitus, vertigo and giddiness which improved but slowly. Perception of the scale of the piano limited to first g sharp or g above the staff ; faradization (negative pole in the meatus filled with water) caused improvement of hearing after a few applications.

3. In the year reported upon, 367 patients came under treatment—201 males, 101 females, and 65 children. Affections of the external ear (diseases of the membrana tympani are counted among those of the middle ear), 63. Chronic eczema of the external ear was treated, according to Hebra's direction, with solution of caustic potassa, and cure obtained in comparatively short time.

De Rossi justly discards the designation, catarrhal inflammation of the external auditory meatus, and he distinguishes only a diffuse and a circumscribed dermatitis. In the acute diffuse form, the best results were obtained from instillations of alcohol. A cicatricial occlusion of the external meatus could be removed only by incision, succeeded by laminaria treatment. Of affections of the middle ear, 267 came under treatment. In acute meningitis De Rossi tried warm ear-baths ; cure followed more slowly than after myringotomy. In acute purulent otitis media, treatment consisted of extensive division of the membrana tympani, which was followed by rapid improvement. In chronic purulent inflammation of the middle ear, De Rossi applied, besides concentrated solutions of silver nitrate, astringent solutions of lead acetate and potassium bichromate. Eleven cases of caries and necrosis of the mastoid process came under treatment, and De Rossi recommends early opening of the mastoid process. The number of cases affecting the inner ear amounted to 25.

4. In continuation to the preceding reports on otology during the last ten years, Guerder discusses the pathology, and commences with the affections of the external ear, which receive a detailed and exhaustive treatment. A special chapter is devoted to the affections of the ear caused by general disease. In the chapter on affections of the tympanic cavity, the difficulty of classification is dwelt upon, and attention is called to the rarity of isolated forms of inflammation, mixed types being more general. Regarding the nomenclature of the sclerosed and hypertrophic forms, Guerder not injustly maintains that these designations should be retained until scientific progress will furnish us more accurate titles. Concerning the details of the excellent, purely objective description of the author, showing his familiarity with the literature, particularly the German, we must refer to the original.

5. Ladreit de Lacharrière,* in his introduction, emphasizes how little smoking is considered as an etiological factor in impair-

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* We beg to refer to the treatise of Triquet on tobacco and the ear, published as early as 1863, of which Ladreit's declarations largely remind us. (Comp. *Journ. of Med. and Surgery*, May 13, 1863. The original was not accessible to me, according to my notes). Triquet described a peculiar form of otitis and deafness consequent on excessive indulgence in tobacco and alcohol. Triquet gives the same symptomatology, likewise divided into three stages : 1st, irritation ; 2d, depression ; 3d, paralysis. Besides, Triquet found simultaneous congestive amblyopia and vascularization of the retina and optic papilla ; sense of smell more or less blunted, occasional reduction of mental activity, and tremulousness Therapeusis : Aside from abstinence, in the first stage, cupping and leeching ; in the second, vapors of ammonia sulphate and application of veratria ointment ; in the third, with very unfavorable prognosis, palliative treatment.—Moos.

ed hearing, and attempts to prove its effests on the mucous membrane of the naso-pharyngeal cavity and the ear, on the organs in the tympanic cavity, the muscles of the soft palate and pharynx, and the nerves in this region as well as the organ of hearing.

Tobacco smoke, according to the author, contains a large number of fixed substances, easily demonstrated by blowing it through a handkerchief, on which it leaves a brown stain. These constituents of smoke, attaching themselves to the mucous membrane, cause the phenomena to be discussed.

Pharyngeal catarrh of smokers, according to Ladreit, is characterized by the swelling, the injection, the dryness, and the insensibility of the mucous membrane of the soft palate and the pharynx. This condition is distinguished from ordinary catarrh by the dark-red appearance of the mucous membrane; its relaxation without the formation of granulations, and the absence of irritability. The patients are unconscious of their affection, until tinnitus and impairment of hearing set in. In the first stage of the affection, there is a slight congestion of the mucous membrane of the tympanic cavity, a somewhat stronger projection of the malleus, and swelling of the mucous membrane of the tube. When long continued, turbidity of the membrana tympani, swelling of the mucous membrane of the tympanum, and diminished mobility of the ossicula, succeed. Ladreit further holds that the affection of the mucous membrane must have an unfavorable influence on the musculature of the soft palate and on the nervous system. The sensory depression is looked upon as the second stage, while the third is said to be characterized by paralysis of the acoustic nerve, with diminution of the former subjective perceptions of hearing. In the first stage, cure may follow the abstinence from tobacco, the histories of two cases being cited in proof. Ladreit's treatment besides consists in astringent gargles, the application of potassium iodide, catheterization and inunction with an iodine ointment on the mastoid process.

6. The first case communicated by Trautmann concerned a patient in whom, after an attack of coughing, there ensued unilateral considerable impairment of hearing, slight pain in the ear, headache, and continuous tinnitus. The examination, instituted one month after the injury, showed three small extravasations of blood in the membrana tympani. Hearing restored.

In another patient of Trautmann's, a double fissure of the membrana tympani, in consequence of a box on the ear, was observed. One of the fissures was behind the manubrium mallei; besides, there was a rupture in the posterior periphery of a cicatrix situated in the anterior lower quadrant.

In the third of the cases reported, the injury was caused by a wagon-pole striking the left parietal bone; unconsciousness, epistaxis, hemorrhage from the left external auditory meatus, which had to be controlled by tamponing. After removal of the plug of lint, which was saturated with bloody serum, two days after the injury, liquor cerebro-spinalis is said to have "decidedly" flowed from the external meatus. Continuous tinnitus, absolute deafness, vertigo towards the affected side, which increased on pressure upon the mastoid process and upon the base of the skull from the naso-pharyngeal space. Diagnosis: Fracture of the left petrous bone. Cure, with deafness and subjective noises.

7. In the continuation of Woakes' essay, reviewed in the preceding report, noises of singing or humming character, of longer or shorter duration, are discussed as occurring either alone or in conjunction with the noises previously considered. Woakes holds that these noises, which must likewise be founded on an objective cause, must be referred either to contraction of the external muscles, or to increased circulation of blood in the relaxed and dilated blood-vessels of the tympanic cavity. Both causes may mutually support each other in effecting these noises by an irritation of the muscles produced by the congestion. Such noises, therefore, may be caused by foreign bodies in the external auditory meatus or in the Eustachian tube; in one case by reflex action, in the other by increase of blood-supply to the tympanum, the blood-vessels of which are in connection with those of contiguous regions. The horizontal position of the manubrium mallei is considered as pathognomonic for retraction of the membrana tympani through contraction of the tensor tympani muscle. Rarefaction of the air in the external auditory meatus diminishes the humming. The noises caused by hyperæmia of the tympanum are the most frequent.

Treatment of the noises forms the last section, in which the author's treatment of retraction of the membrana tympani is especially discussed. In place of Siegel's funnel, Woakes uses for the rarefaction of the air in the external meatus an instrument specially devised by him for this purpose, consisting of a syringe by which the air is exhausted from a pear-shaped globe inserted air-tight into the external auditory meatus. The manipulation of the apparatus does not appear to be any simpler than that of those previously devised for this purpose. No contrivance for measuring the negative pressure employed is attached.

8. Voltolini describes an additional case of otalgia intermittens; besides violent left-sided headache, the entire left ear became painful, not only within, but the auricle likewise. The attacks occurred "every other day, in the morning, almost at a certain hour." Immediate cure by quinia.

9. Schalle employs, instead of his lamp—which on protracted burning heated too strongly and hence proved hardly serviceable—previously described in the *Archiv für Ohrenheilkunde*, Bd. x, either gas-light or any of the better petroleum lamps in the market. Owing to the aberration of the non-achromatic lens and the disproportion in size between luminous body and lens, Schalle does not use the image of the flame for illumination, but the brightest circle of dispersion, the lens being approached to the flame up to 4 *cm*. It is demonstrated by calculation that the best illumination is obtained if the main light-effect is determined to the laryngoscope. In the new apparatus, the attachment of the mirror is improved, and the formerly employed nasal prop is omitted. Repeated experiments proved that the intensity of light obtained by the new apparatus is greater than that of other similar apparatus for illumination.

10. We gather from a notice in the *British Medical Journal* that in various parts of London day-schools for deaf-mutes have been in existence for four years, which are said to have proved successful. Instruction is imparted in the sound-language, and partly in the sign-language. The objection being raised in the report that the parents have to bring their children to school daily, we fail to see its validity, as in Berlin, for instance, children go to school without escort, some coming from a great distance.

External Ear.

11. Obliteration accidentelle du conduit auditif externe, etc. [Accidental Obliteration of the External Auditory Meatus; the Difficulties encountered in Maintaining the Opening after Operation.] By Dr. Ladreit de Lacharrière. *Annales des mal. de l'oreille*, etc. Tome iv, No. 3.

12. Du traitement des tumeurs osseuses du conduit auditif. [Treatment of Osseous Tumors of the Auditory Meatus.] By Dr. V. Bremer, of Copenhagen. *Ibid.*, Tome iv, No. 6.

13. Case of Ivory Exostosis in both Ears. By G. Field. *The Lancet*, July 20, 1878.

14. Contribution à l'étude des tumeurs osseuses, etc. [Contribution to the Study of Osseus Tumors in the External Auditory Meatus.] By Dr. Delstanche, fils. Brussels, 1878.

15. Contribution à l'étude clinique de l'otorrhée catarrhale externe. [Contribution to the Clinical Study of Catarrhal Otorrhœa of the External Ear.] By Dr. Ed. Gampietro, of Naples. *Monatsschr. f. Ohrenheilkde.*, etc., No. 9, 1878.

16. Reflex-Dysphagie. By Dr. J. Ruff, of Stuttgart. *Ibid.*, No. 12, 1878.

17. Note sur les variétés du siége des plaques muqueuses, etc. [Note on the different Sites of broad Condylomata, particularly those of the External Auditory Meatus.] By Dr. A. Desprès. *Annales des mal. de l'oreille*, etc. Tome iv, No. 6.

18. Ueber eine eigenthümliche Randtrübung am Trommelfell und deren Bedeutung. [On a Peculiar Marginal Turbidity of the Membrana Tympani and its Significance.] By Jos. Gruber. *Monatsschr. f. Ohrenheilkunde*, etc., No. 9, 1878.

19. Ueber Myringoplastik. Lecture by Prof. Berthold, (Königsberg). Meeting of Physicists at Cassel.

11. In one of Ladreit de Lacharrière's patients, a peri-auricular abscess had opened into the external auditory meatus. At the first presentation, the region of the mastoid process was much swollen and very painful. Eleven days later, entire alleviation of the inflammatory symptoms was proven, but complete deafness had set in. The external auditory meatus was occluded by a thick, red, new-formed tissue. After incision of the exceedingly hard tissue and removal of two flaps formed thereby, a yellowish serous fluid was discharged from within the external meatus. A few days later, renewed occlusion, repetition of the operation, insertion of a laminaria style which, however, was soon again removed by the patient, it causing too violent pain, so that occlusion recurred. The entire cicatricial tissue was now excised, together with the wall of the meatus from which the cicatricial formation had sprung. Insertion of small pieces of sponge, whereby cure was obtained two months after the first operation.

12. Bremer describes a case in which left-sided deafness had existed from childhood, while, right, greatly impaired hearing had only set in a few months ago. Examination showed the left ex-

ternal auditory meatus, at a depth from 10 to 15 *mm.*, completely occluded by a hard tumor springing from the posterior wall. Right, at a depth of 22 *mm.*, an exostosis was found which, springing from the upper posterior wall of the meatus, nearly filled its lumen. The operation of the latter neoplasm was performed with the instrument employed by the Americans for the drilling of teeth (the dental engine), without, however, penetrating with it as far as the tympanic cavity, which was exposed with the chisel. Formation of granulations followed, cure five weeks after the operation, restoration of hearing.

13. Field gives a full report of the operation for ivory exostoses which had developed deeply in both external auditory meatus of a colleague of his. The tumors, originating at the posterior wall of the meatus, left a narrow fissure in front, and during the operation Field endeavored to protect the membrana tympani by inserting a curved spatula behind the tumor. In the first operation, right, which, as in the above case, was performed with the dental engine, and occupied one and three-quarter hours, complete perforation was not secured, which was only effected at a repetition of the operation two weeks later. After performance of the operation on the other side, inflammation and perforation of the membrana tympani ensued. On both sides, formation of granulations with purulent discharge followed. After the inflammation had subsided, hearing was restored.

14. In Delstanche's very thorough dissertation, the different views regarding the origin and development of osseous new-formations in the external auditory meatus are most exhaustively discussed, and we restrict ourselves to the quotation of the author's concluding remarks:

"Exostoses of the external auditory meatus may develop both before and after the period of ossification of the canal. Most firmly established as causes are: hereditary disposition, independent or traumatic inflammation or irritation of the bone or periosteum of the meatus. The influence of a gouty, rheumatic, or syphilitic diathesis is not demonstrated. Most frequently the tumors originate at the posterior wall of the auditory meatus; their sensibility differs with their depth in the meatus. The subsequent symptoms are caused by the occlusion of the auditory meatus, in some cases by the simultaneous swelling of the tympanic cavity and the meatus. The treatment must consist in removal of the neoplasms."

Delstanche himself observed twenty-five cases of exostosis in the auditory meatus, two of which appeared favorable for operation. In one of these cases the neoplasm of ivory hardness, which filled the entire auditory meatus, was pierced with a drill of two millimetres' breadth. The inflammatory reaction was trifling, likewise after the succeeding widening of the first opening, also performed with a drill. A further enlargement of the opening was obtained by cauterizations with zinc chloride. Cure.*

15. The long duration of the chronic muco-purulent discharge from the external auditory meatus, which Gampietro denominates catarrh of the external ear, according to the author, is caused by atrophy of the walls of the external auditory meatus and the condition of the ceruminal glands. During the incipient hypertrophy of the glands, an increased secretion takes place ; temporarily a cessation of the secretion ensues through occlusion of the excretory ducts. The occlusion is followed by accumulation of the secretion within the glands, and with their opening a renewed discharge appears. In order to produce destruction of the glands and consequent cure, the author performs scarification of the wall of the meatus, which is said to remove the secretion and to cause permanent suppression of the formation of cerumen.

16. After a short discussion of previous observations on reflex manifestations provoked by foreign bodies in the external auditory meatus, Ruff reports the following case : A lady had suffered for two days from inability to take nourishment, as every attempt at deglutition incited an irresistible inclination to vomit. The patient's statement, that she felt the attending spasm in the neck more on the left side, caused the author to examine the ear. Left, a plug of cerumen was found, which, however, did not completely fill the meatus. Hearing normal. After the removal of the plug the dysphagia disappeared permanently.

17. In the course of six years Deprès had opportunities, in the Hospital de Lourcine, to observe six cases of affection of the ex-

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* Some time ago Mr. Delstanche, in the Archiv für Ohrenheilkunde, asked the German otologists, through Prof. Schwartze, to send him their works, in order that he might make them more accessible to the literature of his country. I complied with this request of my colleague, and, among others, forwarded to him at the time a reprint of an article of mine on Perforation of the Osseous Occlusion of the External Auditory Meatus, the paper having appeared in Virchow's *Archiv*, 1878, Bd. 74. Mr. Delstanche, nevertheless, has not so much as mentioned my case in his monograph. Not until after the publication of his article did Mr. Delstanche ask me to excuse that the citation of my work had been lost in the printing office—a fact which he had overlooked, as his eyesight was impaired at the time !—Moos.

ternal auditory meatus among 1,200 syphilitic patients ; of these one was a soft chancre, and five were broad condylomata. All of the latter were proliferating ; in one case they were in the fundus of the meatus, and extended to the membrana tympani. The ordinary site was the lower wall of the meatus. In one case both meatus were affected. Cauterization, with concentrated zinc chloride solution, several times repeated, sufficed to effect rapid cure. In one case only the treatment lasted over six weeks. Desprès thinks that the affection occurs chiefly in those patients in whom otorrhœa previously existed.

18. After Gruber, some time ago, had called attention to the fact that partial and total relaxation of the membrana tympani may give rise to the formation of folds, he now expresses the view that the folds occurring at the posterior upper margin of the membrana tympani may suffer a transmutation into a condition designated by the author as a sort of marginal opacity of the membrana tympani, in which the sides of the fold are grown together. The importance of these opacities is variable. Should the air-douche prove ineffectual, the single or multiple discission of the opaque part is considered the most practicable.

19. Starting from the experience that patients affected with perforation of the membrana tympani are most benefited by causing the perforations to close, Berthold invented a procedure for effecting such closure. Berthold's procedure, by him termed myringoplasty, consists of the transplantation of a small piece of skin upon the location of the perforation, and causing it to grow fast. Of two cases in which the operation succeeded, and hearing was considerably improved, one is narrated in detail. In order to free the margins of the perforation from epithelium, a small piece of court-plaster was pasted on ; three days later it was again removed by syringing, and the membrana tympani dried. A small piece of skin from the forearm, containing within it all the constituents of the cutis, was now with its raw surface laid upon the margin of the perforation, and the external meatus closed with a plug of cotton-wool. The attached piece of skin became cadaverous in appearance, and shrank. Two weeks later only a punctiform opening at the margin of the old perforation remained. In the further course the upper part of the transplanted piece was removed by syringing. The perforation healed perfectly. The spot remained prominent, of a yellowish-white color.

Middle and Internal Ear.

20. Coup de pistolet dans l'oreille. [Pistol-shot wound in the Ear. Extraction of the Bullet.] By DR. TERRILLON. *Annales des mal. de l'oreille*, etc. Tome iv, No. 5.

21. Eine Röhre (Oese) von Hartgummi fünf Jahre in der Paukenhöhle. [An Eyelet of Hard-rubber five Years in the Tympanic Cavity.] By R. VOLTOLINI. *Monatsschr. f. Ohrenheilkunde*, etc., No. 8, 1878.

22. Fremdkörper im Ohre. [Foreign Bodies in the Ear.] Brief Note by Dr. KAATZER, of Visselhörde. *Berl. klin. Wochenschr.*, No. 52, 1876.

23. Wanderung eines von der Mundhöhle in den Pharynx gelangten Hafer-Rispenastes durch die Ohrtrompete, die Paukenhöhle und durch das Trommelfell in den äusseren Gehörgang. [Migration of a Fragment of an Oat-panicle from the buccal Cavity into the Pharynx, through the Eustachian Tube into the Cavity of the Tympanum, and through the Membrana Tympani into the External Auditory Meatus.] By DR. V. URBANTSCHITSCH, of Vienna. *Ibid.*, No. 49, 1878.

24. Zur Physiologie der Tuba Eustachii auf Grund einer Beobachtung von doppelseitigem organischem Verschluss der Rachenmündung derselben. [Contribution to the Physiology of the Eustachian Tube, based on an Observation of bilateral organic Occlusion of their Buccal Openings.] By Dr. H. DENNERT, of Berlin. *Deutsche Zeitschrift f. pract. Medicin*, No. 44, 1878.

25. Contribuzione allo Studio della Medicina operatoria dell' Orecchio. [Contribution to the Study of the Operative Treatment of the Ear, etc.] By PROF. E. DE ROSSI. *Atti dell' Academia medica di Roma.* Anno iv, Fasc. 1.

26. Beitrag zur operativen Behandlung der Ohreneiterungen. [Contribution to the operative Treatment of Purulent Discharges from the Ear.] Inaug. Dissert. by H. BIRCHER, of Aarau. Berne, 1878.

27. Ein Beitrag zur Lehre von der Trepanation des Proc. mastoideus. [A Contribution to the Study of Trephining the Mastoid Process.] Inaug. Dissert. by M. NEILING, Kiel, 1878.

28. Ueber Cerebralerscheinnungen beim chronischen Mittelohrcatarrh. [On Cerebral Symptoms in chronic Catarrh of the Middle Ear.] By DR. C. BLAU, of Berlin. *Deutsche Zeitschrift f. pract. Med.*, No. 28, 1878.

29. Nystagmusartige Augenbewegungen in Folge eines Ohrenleidens. [Nystagmoid Ocular Movements consequent upon an Affection of the Ear.] By PROF. E. PFLÜGER. *Deutsche Zeitschr. f. pract. Med.*, No. 35, 1878.

30. De l'otite et du sulfate de quinine, etc. [On Otitis and Quinia Sulphate in Mental Disturbances and Convulsions of Children caused by Ear Affections.] By DR. ROUCHUT. *Gazette des hôpitaux*, 1878.

31. Nouveau procédé pour faire pénétrer de l'air comprimé, etc. [A new Procedure for causing the Ingress of Compressed Air and Medicated Vapors into the Middle Ear without the Aid of a Catheter.] By DR. LÉVI. *Annales des mal. de l'oreille*, etc. Tome iv, No. 3.

20. Under Terrillon's treatment there came a patient who for four months had carried a pistol-bullet in his left petrous bone. The ball had entered through the mouth of the external auditory meatus, had caused profuse hemorrhage, and in the surrounding parts rather violent inflammation, which rapidly subsided. A fistulous opening, purulent discharge, and complete deafness remained. With the electric bullet-probe the ball was found embedded one centimetre deep in the bone. By means of a special contrivance one could drill a hole into the bullet, without succeeding, however, in removing it this way. An incision was then made in the line of attachment of the auricle, the latter, together with the fistula in the soft parts, bent forward, and the osseous fistula at the anterior surface of the base of the mastoid process exposed. The bullet retained in the bone could be removed by widening the entrance opening by means of the trepan. The depth of the osseous canal, after removal of the bullet, measured 16 *mm.* Cure.

21. A hard rubber eyelet which Voltolini had inserted into the membrana tympani of a patient, fell into the cavity of the tympanum, and could not be removed. The succeeding painfulness quickly subsided, and the opening in the membrana tympani closed again. Hearing as compared with previous state undiminished. When patient after the lapse of five years again presented himself, the tympanic cavity was opened by a crucial incision, and the eyelet extracted with a delicate hook. It was surrounded by hyaline mucus. The mucous membrane of the tympanic cavity was deeply reddened. No inflammatory reaction set in.

22. Kaatzer's original communication refers to a peasant whose

ear was found filled with maggots. Instrumental removal did not succeed; soap-suds, tobacco smoke, and chloroform likewise proved ineffectual. Kaatzer now tied a slice of Hollandish cheese over the patient's ear. On the next morning the cheese and worms are said to have disappeared.

23. The case communicated by Urbantschitsch concerned a lady patient, æt. 51, who had bitten an ear of oats off the paniculate branch and swallowed the latter. During its migration from the pharynx into the external auditory meatus, the patient first had a scratching and stinging sensation in the region of the roof of the tongue; in the course of the next few days, in the upper pharyngeal space, together with violent pain which, at the end of the third week, was located in the depth of the ear. With this there occurred slight impairment of hearing, painful swelling of the walls of the auditory meatus, developing later into an abscess. Owing to the insufferable pain, there was difficulty in masticating, loss of appetite, fever-paroxysms, repeatedly accompanied by delirium. In the fifth week, after a sensation as if the panicle had placed itself crosswise in the ear, the patient experienced a violent report with subsequent discharge of blood and pus. In the examination now instituted, a perforation of the membrana tympani was demonstrated, but the panicle could not be discovered. A month later, she believed that she distinctly felt the panicle working outward, whereupon it became visible in the external auditory meatus on the same day, and could be removed. The panicle had a length of 3 *cm.*, and, formerly straight, now showed an L-shaped bend. Quick subsidence of the inflammatory symptoms. Healing of the perforation.

24. Dennert observed the following interesting case: In a female patient there existed bilateral occlusion of the pharyngeal opening of the Eustachian tubes in consequence of syphilis, together with extensive destructions in the nasal cavity, affording an unobstructed view from in front into the naso-pharyngeal space. In place of the tubal openings, a smooth white cicatricial tissue was found, and no motion of the soft parts in the naso-pharyngeal space was observable during deglutition.

The atrophied membrana tympani on both sides partially adhered to the wall of the labyrinth; on the left less distinctly, on the right there can be seen, during the act of deglutition, first an evidently negative oscillation (inward) of the membrana tympani, followed by a positive oscillation (outward). For the cure of the greatly impaired hearing, the membrana tympani on both sides was incised, and D. succeeded in removing a tenacious fluid from the tympanic cavity by means of varied aërial pressure produced with Siegle's funnel, and to obtain a considerable and permanent improvement of hearing. The occurrence of varied aërial pressure in the tympanic cavity during closure of the mouth of the tube, the author explains by alterations of the lumen in the Eustachian tubes.

25. In his lecture, De Rossi gives to his countrymen a full report of the principal operations at present performed on the ear. He begins with the catheterization of the Eustachian tube, then follows paracentesis of the membrana tympani, which is succeeded by the artificial opening of the mastoid process. The latter is very thoroughly discussed, and, based on personal experience, the indications for the operation are laid down, in harmony with the views at present prevailing in regard to the operation. In one case with extensive cerebral symptoms operated on by Rossi, he removed with great difficulty a sequestrum from the petrous bone, after which a large pulsating vessel, doubtless the sinus transversus, was exposed in its depth. Death seven days after the operation. At the autopsy a larger and a smaller abscess were found in the cerebellum.

Then follows a full description of the morbid processes which, through participation of the ossicula, diminish the conduction of sound, and the operative procedures instituted therefore are explained—section of the posterior folds of the membrana tympani, tenotomy of the tensor tympani, myringectomy, mobilization of the stapes after Kessel. A case is narrated in which Rossi succeeded in obtaining greatly improved hearing by loosening the manubrium mallei from the promontorium to which it was united. In another case Rossi undertook, likewise with very great success as to hearing power, in anchylosis of malleus with the incus, to sever the ligaments between stapes and incus.

The interesting remarks of De Rossi, especially those in the last section, are deserving of careful attention, and we regret being unable to report them more fully, owing to the limited extent of our extracts.

26. Bircher, in his dissertation, discusses three cases which offered him the opportunity of performing the artificial opening of the mastoid process. All the cases occurred in adults, in whom, in consequence of purulent otitis media, accumulations of pus and

formation of granulations had taken place in the air spaces of the mastoid process, with softening of the interposed osseous walls. In the first case, a swelling existed behind the ear; on cutting into it, the knife penetrated deeply into the softened bone, and the mastoid process was completely hollowed out with the sharp spoon. In the second case an abscess had formed behind the ear; after incision, a spot denuded of periosteum was scraped out with the sharp spoon. Three weeks later, renewed recurrence of pain, repetition of the operation. Extensive exposure of the field of operation, detachment and drawing forward of the pinna, the external osseous shell removed with the chisel, scraping out of the morbidly softened bone, opening of the antrum. The process extended to the occipital bone, and the dura mater was exposed to the extent of 1.2 *cm.* in diameter. In the third case there was likewise infiltration of the soft parts around the pinna; on incision a part of the bone showed a blue discoloration, and the opening was begun at this spot, the morbid portions being removed with chisel and spoon. In this case, too, the dura mater was exposed by an opening 5 *mm.* in diameter. The three cases healed under antiseptic treatment.

In conclusion, Bircher cites the various views regarding the performance of the operation and arrives at the view that no positive rule can be laid down, that in every case we must proceed in accordance with the conditions present. If the surface of the bone is softened, we must penetrate from there.

27. Neiling's dissertation is based on four cases in which Esmarch successfully performed the artificial opening of the mastoid process.

In the first case, in consequence of purulent otorrhœa, abscess and formation of fistulæ had occurred in the neighborhood of the ear, and at the first presentation the skin from behind the right ear to the middle of the back of the head was hard and swollen, with several fistulous openings. Dilatation of the fistulous openings and removal of the greatly thickened, hard cortical layer with chisel, scraping out of the cellular spaces which were in a state of cheesy degeneration and filled with granulations, removal of the upper part of the posterior wall of the auditory meatus. The second case occurred in a girl aged 13, in whom a pyæmic pleuritis complicated an inflammation of the middle ear of long standing, with polypoid proliferations and œdematous swelling of the mastoid process. In a semi-conscious state of the patient, after incising the cutis immediately behind the attachment of the pinna, a pus-cavity in the mastoid process was opened with a slender drill, and the drill-hole enlarged with the chisel. An abscess cavity, the size of a walnut, filled with cheesy, fœtid masses, was found ; this was scraped out with the sharp spoon, and, besides, the posterior wall of the auditory meatus removed. In the third case the mastoid process, containing a collection of pus, was opened with the drill ; while, in the fourth case, an abscess cavity was laid open from a fistulous passage with the chisel, and the posterior wall of the auditory meatus was also removed.

Respecting the performance of the operation, Neiling thinks *the one done by Esmarch, drill and chisel operation combined*, the most commendable, and he emphasizes the fact that Esmarch has applied with best effect the method recommended by the Reviewer, based on his anatomical investigations—to furnish the pus a free means of exit toward the auditory meatus.

28. In one of Blau's patients affected with chronic catarrh of the middle ear, there existed at the same time a series of nervous phenomena—a feeling of pressure and fulness in the head, depression of mind, frequent attacks of vertigo, with unsteadiness during walking and standing. The impairment of hearing on both sides was slight ; by auscultation a considerable swelling of the mucous membrane of the tube was diagnosed. By the treatment instituted—injection of solutions of zinc sulphate and gargles—the symptoms were quickly removed.

The author then mentions the different nervous symptoms which have been observed to proceed from the ear, especially those caused by foreign bodies, and thinks that in his case likewise the cause of the nervous phenomena has to be sought in the chronic catarrh of the middle ear.

29. In connection with Schwabach's observation communicated in our last report (p. 197), Pflüger reports on a similar case : During the extirpation of a polyp which, as shown by the operation, sprang from the cavity of the tympanum, besides manifestations of vertigo, exceedingly rapid oscillatory movements of both eyes in a horizontal plane occurred. On repeating the operation, and on grasping the polyp with the nippers, the same phenomena recurred. Concerning the manner in which nystagmoid movements of the eyes are produced by the irritation exerted, Pflüger, basing on the experiments of Hitzig and Curschmann, according to which nystagmus may occur during irritation of the flocculus of the

cerebellum and the region of the crura cerebelli, thinks that a direct conduction of the irritation to the peripheral parts of the brain is not improbable.

30. Rouchut in his dissertation discusses the reflex neuroses of children derived from the ear, cephalalgias, mental aberration, and convulsions, and communicates three corresponding cases. In a girl æt. 5, in connection with acute amygdalitis, acute otitis had occurred, accompanied by violent pains and intense febrile phenomena. Three attacks of convulsions, lasting ten minutes, with loss of consciousness. Thereafter a transitory discharge from the ear; cure. The second case, seen but twice by the author, happened in a boy of 13, who for three years had suffered from a purulent otorrhœa; in him at times obstinate cephalalgias, deafness, vertigo with falling without loss of consciousness occurred. In a girl of 10, affected with chronic purulent otorrhœa, during suspension of the flow from the ear, attacks of acute mania occurred, which, though of short duration, recurred two or three times per week. Inhalations of chloroform shortened these attacks. Treatment with quinine, 1.0 per diem. After eighteen days' use of the remedy the nervous symptoms disappeared, and discharge from the ear was again established. While the author ascribes the cure to the action of the quinine, it appears at least just as likely that the cure was effected by the retained secretion in some manner finding egress again. An examination of the ear does not appear to have been instituted either in this or the other two cases. In the symptoms discussed, Rouchut thinks to have obtained the best results by the exhibition of quinine, 0.5–1.0 gr. per diem.

31. Levi employs Roustan's method with the air-douche to blow medicated vapors through the tubes. The injection is performed with a rubber bulb, while the patient is directed to make, with mouth closed, a motion as if blowing into a tube.

Nose and Naso-pharyngeal Space.

32. Ueber Ozäna und eine einfache Behandlungsmethode derselben. [On Ozæna and a simple Method of Treatment of it.] By DR. J. GOTTSTEIN (Breslau). *Berl. klin. Wochenschr.*, No. 37, 1878.

33. Entfernung eines Fremdkörpers aus der Nase. [Removal of a Foreign Body from the Nose.] By DR. BETZ, of Mayence. *Monatschr. f Ohrenheilkunde*, etc., No. 12, 1878.

34. Ein casuistischer Beitrag zur Aetiologie der Nasenblutungen. [A practical Contribution to the Etiology of Epistaxis.] By DR. LAUDEN, of Elbing. *Berl. klin. Wochenschr.*, No. 49, 1878.

35. Watery Discharge from one Nostril. Communication to the Lond. Clinical Society. By DR. J. PAGET. *Brit. Med. Jour.*, Dec. 7, 1878.

36. Excessive Secretion from the Nose. By J. ALTHAUS. *Brit. Med. Jour.*, Dec. 7, 1878.

37. Ein neuer Catheter zur Auswaschung der Nasenhöhle. [A new Catheter for the Irrigation of the Nasal Cavity.] By DR. A. FISCHER, of Budapest. *Pester chirurg. Presse*, 1878.

38. Les tumeurs adénoides, etc. [The adenoid Proliferations of the Naso-pharyngeal Space; their Influence on Hearing, Respiration and Phonation; their Treatment.] By DR. LÖWENBERG. Paris, 1878.

39. Casuistischer Beitrag zur Operation der Nasenrachenpolypen unter Beihilfe der Rhinoscopia anterior. [Practical Contributions to the Operation of Naso-pharyngeal Polyps, assisted by anterior Rhinoscopy.] By PROF. E. ZAUFAL. *Prag. Med. Wochenschr.*, Nos. 17 and 18, 1878.

32. After mentioning the views of Zaufal and Michel regarding the origin of ozæna, Gottstein confirms the surprising concurrence of ozæna with abnormal width of the nasal cavities, and he concludes from his observations on the living that atrophy of the turbinated bones is at the same time joined with atrophy of the Schneiderian membrane. Gotthold does not think the demonstration proved, that in ozæna an increase of secretion is present, and he believes ozæna to be a constant symptom of that stage of chronic rhinitis in which atrophy of the mucous membrane has set in. Destruction of the muciparous glands, diminution and alteration of the secretion which by rapid desiccation remains attached to the mucous membrane, and is decomposed.

In accordance with this conception, Gottstein explains the unfavorable results of our therapeutic measures, and he thought of a simple mode of treatment, which consists of an alternate plugging of the nose with cotton tampons from 3 to 5 *cm.* long and as thick as the thumb. The cotton tampons remain *in situ* for twenty-four hours, and after removal are found saturated with a yellowish mucus; there is no trace of fœtor, not even when scabs were present before their insertion. The application of the tampons caused no trouble or inconvenience to the patients, even if allowed to remain over night.

33. In a girl of four years an offensive discharge from the nose had existed for four weeks ; examination showed the left lower turbinated bone and the septum greatly swollen ; nevertheless, a black body could be recognized about 1½ *cm.* from the external opening. It could not be removed with the forceps, and the attempt to push it back so as to bring it into a more favorable position for extraction likewise failed. With a thin galvano-caustic wire the body was severed, and the two halves could be easily extracted with the forceps. The body proved to be a tooth from a hard-rubber comb.

34. One of Laudon's patients, after the last campaign, fell sick of some affection of the liver, pain in the region of the liver, gastric disturbances, icterus. After subsidence of the former troubles the icterus remained. Soon after the first appearance of the affection, the troubles were complicated by epistaxis, first occurring once, later twice daily almost incessantly for seven years, thus materially reducing the patient's strength. Patient complained of a painful feeling of pressure in the left nostril. Examination showed only a moderately inflamed swelling of the mucous membrane, left. Treatment proved unavailing until patient finally, after a violent fit of sneezing, discharged a small parasite from the nose, when complete cure ensued. The parasite, resembling a small earthworm, on close examination proved to be a mite of the genus Linguatulidæ, the so-called Pentastoma tænioides. The parasite ordinarily infests the frontal and nasal cavities of animals ; in some localities (A. v. Humboldt), also those of man. In the human subject the parasite also occurs in the liver.

35. Paget exhibited to the London Clinical Society a fluid discharged from the left nostril of a lady who for eighteen months had suffered from uninterrupted secretion from that nostril. The nature of the fluid was watery, slightly alkaline, with a small admixture of albumen ; 120 grm. in one afternoon and evening. She was otherwise healthy, but had received a blow on the forehead two years before. The discharge, however, did not set in until six months later. Paget leaves it undecided whether the fluid originates in the cavities adjoining the nose, in the subarachnoid space, or in the arachnoid sac. Catarrh had not preceded, nor had there ever been a purulent secretion.

36. In connection with Paget's communication, Althaus reports a case in which continued secretion from both nostrils existed, accompanying paralytic phenomena in the region of the trigeminus. Besides, an increased secretion from the mouth was present. A handkerchief held in front of nose and mouth was in a short time saturated with a watery, slightly alkaline fluid. According to Althaus, the secretion of the Schneiderian membrane, brought about by nerve-fibres of the sympathetic, is regulated and inhibited by fibres of the fifth pair. On removing the influence of the latter, the sympathetic fibres obtain the upper hand, and hypersecretion ensues. By the application of the constant current, the excessive secretion was removed.

37. Fischer's pretendedly new nasal catheter consists of a tube which is bent in the shape of a hook at the part to be introduced into the naso-pharyngeal space from the mouth, and ending in a sieve-like perforated knob. The irrigation of the nasal cavity is said to succeed easily and certainly with this instrument.

38. Löwenberg, in his extensive pamphlet (75 pp.) gives an exhaustive representation of the adenoid proliferations, with their etiology, symptomatology, and treatment. Löwenberg appears the more fitted for such a task, as he is one of those who published observations on the affection before the appearance of Meyer's well-known work. The several chapters, especially the symptomatology, are elaborated with the greatest care, and all conditions entering into the consideration are most thoroughly discussed. The habitual cephalalgias caused by adenoid proliferations, given especial prominence by Meyer, which disappear on removing the latter, might perhaps have been mentioned. In the chapter on diagnosis, the rhinoscopic and digital examinations of the naso-pharyngeal space is fully discussed. In order to relax the velum palati during rhinoscopic examination, Löwenberg causes the patient to breathe through the nose and blow air through it. Aside from digital examination, mention might have been made of the examination with the probe, guided by the mirror. For treatment, cauterizations with silver nitrate suffice only in the simpler cases ; in operating, Löwenberg employs a forceps with cutting branches ; these, having the proper curvature, are introduced from the mouth, guided by the mirror or finger, and the proliferations are grasped and cut off.

39. On the strength of two cases, Zaufal attempts to demonstrate that, in extraordinarily large naso-pharyngeal polyps, an-

terior rhinoscopy may be of greater assistance to the surgeon than posterior.

In the first of the two cases described, he had to deal with nasal polyps, one of which had proliferated into the naso-pharyngeal space and deeply into the lower pharyngeal cavity. By means of the nasal funnel Zaufal was enabled to satisfy himself that the walls of the naso-pharyngeal space were healthy, and that the polyp could not have sprung from them. In conjunction with digital examination a cord was found extending toward the right middle turbinated bone, so that the source had to be looked for in this neighborhood. The bulk of the polyp in the naso-pharyngeal space was removed with the galvano-caustic loop from the left nasal cavity. The remainder, and the polyps situated in the anterior part of the nose, were removed partly with the cold, partly with the hot wire loop. After the removal a transitory ozæna set in. No relapses occurred.

The second case likewise concerned a nasal polyp which had proliferated into the naso-pharyngeal space, and which sprang from the end of the middle turbinated bone. The loop was placed horizontally across the lower margin of the choana, pushed over the polyp with the finger introduced by the mouth, was then brought to a red heat, and the stem severed. The remaining parts were removed in the ordinary manner.

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ARCHIVES OF OTOLOGY.

A CASE OF PAROTIDEAN AND INTRA-TYMPANIC MALIGNANT TUMOR.

By H. KNAPP.

With notes from Drs. H. B. SANDS and A. H. BUCK of New York. and Drs. S. H. PECK and S. J. PARKER of Ithaca, N. Y.

THE rarity and importance of tumors originating in the tympanic cavity or extending to it from adjacent structures may justify the following communication of a case which, though lacking the post mortem autopsy, seems to offer no small clinical and pathological interest. The patient was under the care of several physicians besides myself, viz., Drs. H. B. Sands and A. H. Buck of New York, and Drs. S. H. Peck and S. J. Parker of Ithaca, N. Y., to whom I am indebted for the privilege of embodying in this paper the substance of more or less extensive notes which they kindly placed at my disposal.

Mr. J. H. W., æt. 37, consulted me May 7, 1877, on account of sudden deafness in his right ear. Below and in front of his right ear there was a tumor the size of a hen's egg, which he had first noticed six or seven years previously. It had increased very slowly at first, but quite perceptibly during the last six months. His left ear was affected with chronic otorrhœa, without pain or any symptoms of irritation. His right ear never discharged, and he could always hear well with it until three days before he came to me. At that time he went to bed feeling and hearing as well as ever, but on awaking the next morning, he found that he was deaf.

Condition at first visit.—When the left ear was closed, he could understand ordinary speech at the distance of five feet, and hear the watch tick when in contact with the right ear, the right mastoid process or the forehead. There was no diminution of sensibility or mobility in the face or any part of the body, and his mental faculties were undisturbed.

The right membrana tympani was uniformly bluish-red, slightly convex and greatly dislocated forward. The cone of light was absent, but there was a dull roundish reflex on the posterior lower part. The malleus was seen in its ordinary direction from above-forward to below-downward, but its tip lay less deep in the canal than the short process. Neither the drumhead nor the adjacent parts of the ear-canal showed increased sensibility to the touch, and the drumhead yielded to the probe as if a soft substance, harder than liquid, were behind it.

The slow development of the pre-aural and infra-aural tumor, the pushing forward and appreciable resistance of the drumhead, together with the absence of inflammatory symptoms seemed to me evidence enough of the existence of a tumor within the tympanic cavity. The sudden occurrence of the deafness, I thought, was analagous to the sudden deafness caused by plugs of cerumen, which do not impair hearing, so long as there is the slighest chink between them and the wall of the meatus. As soon as this chink disappears, the deafness is manifest, and this is frequently observed to occur suddenly. In the same way, I imagined, the tumor in the drum cavity had grown imperceptibly, and only interfered with the hearing when it had occluded the whole cavity, or at least occupied the oval window and the niche of the round window. This event must of necessity have happened at some period in the progressive growth of the pseudo-plasm ; but the sudden deafness might have been caused also by the occurence of a serous or hemorrhagic effusion into the drum, an accessory symptom which is not infrequent in the progress of tumors occupying other parts of the body, for instance the skull or the eye.

When, the next day, I found the condition of the patient unchanged, I made an incision with a paracentesis needle into the drum-membrane in front of and below the handle. The edges of the wound at once retracted, and through the gaping opening I saw a reddish, fleshy growth, filling the whole space behind the displaced membrana tympani. The cut-surface showed that the membrana tympani was not thickened. The incision caused no particular pain, liberated no pus, serum or blood, but gave rise to considerable hemorrhage, and did not improve the hearing. When touched with a probe the tumor gave the sensation as of a somewhat soft, fleshy mass.

Clinical diagnosis. The existence of a non-inflammatory, fleshy and vascular tumor in the tympanic cavity having been demonstrated, and for six years the development of another tumor in the parotid region having been observed, two questions presented themselves: Had these tumors any connection one with the other, and what was their nature?

As primary intra-tympanic tumors are exceedingly rare, and tumors in the parotid region are known to extend to the middle ear; furthermore, as the pre- and infra-auricular tumor had been steadily growing for at least six years, and evidences of any ear affection having been noticed only five days, I inferred that most probably I had to deal with a *primary parotidean growth, which had entered the tympanic cavity through the Glaserian fissure or its vicinity.* I further assumed that the two tumors were of the same nature, probably *adeno-chondro-sarcomatous.* This diagnosis was based upon the fact that the parotidean tumors are commonly of a complex nature: adenomatous, sarcomatous, cartilaginous, myxomatous and carcinomatous portions being frequently found together in the same specimen. The presence of myxoma appeared unlikely, as the parotidean tumor felt uniformly firm; and for carcinoma the patient was scarcely old enough.

Under this supposition I advised the patient to have the parotidean tumor removed by a skilled surgeon, and recommended Dr. H. B. Sands, whom I had seen successfully operate in similar cases. I imagined that if the supposed connection between the tumors were more than microscopical, both tumors might be removed in the same sitting. He followed my advice, but delayed the operation. The incision which I had made in the drumhead was followed for a few days by a scanty sero-purulent discharge. On May 23d he came to me again, having had great pain in the ear the previous day and night. I found the inner half of the auditory meatus occupied by the tumor, and the walls of the outer half red, swollen and tender to the touch. I ordered warm instillations of a weak solution of carbonate of soda. During the next few days the inflammatory swelling in the outer part of the ear-canal and its surroundings was more pronounced. On May 29th the pain was relieved. An abscess had formed, and pus escaped upon pressure on the tragus. Both Dr. Sands and myself thought it advisable to delay the operation until the inflammatory symptoms had subsided. When in a few weeks this had occurred, on examination (June 20th) I found that the aural tumor filled the entire meatus, whereas there was no noticeable change in the parotidean tumor. My departure for Europe being at hand (June 23d) I advised him to let another aural surgeon in my stead take charge of his case, and proposed Dr. A. H. Buck, whom he also consulted at once.

As to the operation, Dr. Sands kindly gave me the following note:

"*June* 26, 1877. I excised the parotid tumor at the New York, Hospital. A vertical incision, extending from the level of the meatus down to the lower end of the growth, measuring from three and a half to four inches in length, was made over the middle of the most prominent part of the tumor. It included only the superficial tissue. The remaining tissues were cut on a grooved director, and carefully dissected out with the fingers. The large mass was first removed, and beneath it was found a sort of a pedicle, which was also removed by careful and delicate dissection. The growth proved to be an enchondroma, covered by parotid glandular tissue externally, and firmly adherent to the digastric and other deep-seated muscles. The operation was difficult and tedious, but no large vessels or nerves were divided. After the operation no paralysis of the facial nerve could be detected, although the tumor was apparently situated beneath the parotid gland, the tissue of which was freely divided. No connection existed between the parotid and aural tumors; and with Dr. Buck's assistance I removed as much as I could of the latter by means of a dressing forceps, having previously snapped two pieces of wire in attempting to affect removal with the "snare."

July 24, 1877. Patient remained in the hospital until a fortnight since, when he went to Ithaca. To-day he returned nearly well.

Dr. Satterthwaite, who has examined the specimen, reports that the parotid tumor is cartilaginous, the aural tumor cancerous; but Dr. Buck thinks, from an examination he has made, that the latter is also enchondromatous. (See below.)"

For the following important informations I am indebted to Dr. A. H. Buck:

"The external tumor, removed by Dr. Sands, proved to be a mixed growth (fibrous, chiefly, but in part cartilaginous and in still others, cellular). The parotid gland was found spread out over the mass in the form of a capsule, but was not involved in its growth. Very careful search was made, but at no point could any offshoot be discovered which might be looked upon as the connecting link between the outer tumor and that within the ear. One portion of the growth seemed to terminate at the tip of the stylo-mastoid process. This suggested the idea that the extension of the growth to the middle ear had perhaps taken place by way of the stylo-mastoid foramen. This could hardly have been the case, however, as there was complete absence of facial paralysis.

July 25, 1877. The external wound in the neck has almost entirely healed, and the patient is now exceedingly anxious to have an effort made to remove the aural growth. The pain in the region of the ear continues, and the tumor has increased quite perceptibly in size. By means of a curved blunt-pointed knife, made expressly for this case, I was able to cut off quite a large portion of the growth. The bleeding was active, but not profuse. The patient was entirely unconscious of pain (etherized) during the cutting operation. As soon as the bleeding had ceased, I attempted to further diminish the size of the mass by gnawing away small portions with a miniature "rongeur." After one or two seizures I was obliged to desist, as the blood poured from the ear in a continuous stream, and the bleeding showed no tendency to stop of itself. The hemorrhage was readily arrested by stuffing the ear with cotton, and applying pressure by means of a bandage passed over the head and under the jaw.

The slippery character of the masses removed (like boiled sago) was a very noticeable feature ; and when broken down, the fragments did not show the slightest trace of possessing any fibrous tissue in their composition.

The *microscopic condition* of one of these masses from thin sections made by Dr. W. H. Porter of New York, stained with carmine, and mounted in Damar varnish, was as follows : With low powers it appears that the tumor is composed in part of *round, oblong*, and *branching alveoli* * *filled with medium-sized cells* which have imbibed the staining material quite uniformly and abundantly. Only here and there among these cells can the outlines of a still more deeply stained nucleus be distinguished. The *interalveolar tissue* occupies fully one half of the entire specimen. It has apparently not imbibed any of the staining material, though the round and oat-shaped nucleus-like bodies, scattered quite uniformly throughout its substance, are as deeply stained as the *epithelioid* elements in the alveoli. At many spots the stained nuclei seem to be surrounded by a perfectly colorless hyaline substance, sharply limited against the contiguous inter-alveolar tissue : in other words, *cartilage cells seem to enter largely into the composition of the matrix of the tumor.* All the blood-vessels encountered are of comparatively large size, and filled with blood corpuscles. At no point can I find distinctly fibrillated connective tissue.

Later on the day of the operation a second and very unsatisfactory effort was made to diminish the size of the growth. The copiousness of the bleeding, however, again obliged me to desist.

July 26, 1877. I introduced four red-hot needles in succession into the mass, with a view of diminishing the bleeding. As soon as the rongeur was used, however, the bleeding became as active as on previous occassions. Before I had reached the middle ear in my mining operations, I thought it advisable to abstain from further interference.

Soon afterwards a large abscess developed on the side of the neck, just below the mastoid process, and the patient was again transferred to Dr. Sands."

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* *Statics* by Dr. H. K.

He soon returned to Ithaca and was treated by Dr. S. H. Peck, whom he had consulted in June, 1877. Dr. Peck writes: "In my opinion there existed a connection between the tumor of the neck and the growth in the ear, and I advised non-interference. Patient seen again August 14, 1877, considerably exhausted by his journey and the operation. He complained of paroxysmal recurrence of pain and inability to rest at night, which was relieved by morphia 0.01 gr. An indurated circumscribed tumor developed beneath the auricle and increasing slowly, carried the ear outward."

Oct. 25, 1877. I saw the patient again myself in consultation with Drs. Peck, Sands, and Buck. The auricle was considerably raised by a tumor underneath and around it, the size of a man's fist. The tumor was hard, uneven, filled the meatus, and showed several fistulous openings, discharging thin pus. Facial paralysis had existed for five days. As it was evident that the temporal bone in all its parts was invaded by the pseudoplasm, and as a radical removal was impossible, we consoled the patient as well as we could, stating that another operation would be too dangerous, but that tumors are sometimes seen to exfoliate by a kind of sloughing process, and a natural cure thus be effected.

He returned to Ithaca. The remainder of his sad history may be briefly told from notes of Dr. Peck and Dr. Parker. The tumor continued to grow in every direction. When its base was six inches in diameter, the cutis began to crack, causing excoriated, secreting surfaces partaking of the character of indolent ulcers which increased with the growth of the tumor. Nine months before his death, capillary hemorrhages began to occur from the denuded surfaces, and he lost about four grams of blood at every dressing. Repeatedly, however, "profuse hemorrhages from large vessels and by jets took place, usually in the forenoon, which Dr. Parker checked in a few moments without the least difficulty by dry pulverised alum, or persulphate of iron and other dry powders on cotton lint applied to the bleeding part." The local treatment consisted of disinfectant and astringent applications; the general treatment of anodynes at night and at intervals vegetable and mineral tonics. The patient's general condition during the growth of the tumor was good, his appetite was fair and he suffered but little pain. There was no enfoliation by sloughing in the circum-aural part of the tumor, but those portions of the intra-aural growth which protruded beyond the external meatus always decayed in a short time. Progressive emaciation accompanied the growth of the tumor, death taking place from exhaustion, September 15, 1878, fifteen months after the first operation. Post mortem refused.

Dr. Peck describes the last stage of the tumor as follows:

"At the time of death the tumor measured in circumference at the base twenty-two inches, in the antero-posterior diameter eight inches, in the vertical seven inches. Its elevation over the surface of the skull was five inches. It extended anteriorly to within half an inch from the orbit, posteriorly nearly to the occipital protuberance, superiorly to the parietal eminence, inferiorly to the angle of the lower jaw. The ear, normal in size and appearance rested upon the external surface of the tumor, being carried outward by the tumor. In general appearance the tumor presented a lobulated form, viz: a superior, middle and inferior lobe, the superior being above the ear, the middle behind, and the inferior below the ear. Mastication was slightly interfered with, simply by the weight of the tumor. No protrusion of the growth into the bucco-pharyngeal cavity was noticeable. No mental disturbance."

Remarks.—The importance of the case may justify the foregoing somewhat lengthy description. It appears that we had to deal with an extra-aural and an intra-aural tumor. A connection between the two may be assumed, but, in the primary stage at least, was not proven. The aural portion, when first come to notice, was truly intratympanic, as demonstrated by the presence and incision of the unbroken membrana typmani. The microscopic examination proved both tumors essentially of the same nature; a chondro-sarcoma (alveolar) or a chondro-adenoma, or chondro-carcinoma. The description of Dr. Buck corresponds most nearly to that of a chondro-adenoma* Since these tumors are common in the parotid region, and the external tumor had existed six years before the internal made itself noticeable to the patient, I, for my part, consider it most probable that the external tumor was primary, and extended to the middle ear. From the description it is evident that it occupied the locality of the base of the parotid gland, and I believe

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*See Paget, *Lectures Surg. Pathology*, ii. p. 201.

that it probably started from the deep-seated portions of the gland, whereas the unaffected external portions lay over it like a capsule. Yet it has to be considered that Dr. Sands mentions that the tumor apparently lay beneath the gland, and Dr. Buck explicitly states that the parotis was not involved by the growth. The deep-seated portion of the gland occupies the posterior part of the glenoid fossa which is separated from the tympanic cavity only by a thin and somewhat porous plate of bone, and connected with it even by two canals, the canal of Huguier through which the chorda tympani, and the Glaserian fissure through which the ligamentum mallei anterius and the tympanic branch of the internal maxillary artery enter the tympanic cavity. I advised the removal of the external tumor, on the supposition that in this way the pseudoplasm also had made its way into the ear, and thought as stated above, that possibly the connection was more than microscopic, in which case the aural tumor might have been removed together with the parotidean from the posterior part of the glenoid fossa. At the operation no such connection could be traced, yet the whole history of the disease makes me still adhere to the opinion that there was a connection. Let me mention in support of this supposition that for a long time the simultaneous occurrence of intra-ocular and extra-ocular tumors was referred to separate and independent centres of formation, because no connection was detected between the tumors. Yet more careful microscopic investigation discovered in almost all cases the strings of elements of the pseudoplasm through the sclerotic, sometimes, it is true, in very slender and crooked tracks; yet the communicating links were there—though they had long escaped observation—despite the fact that the melanotic sarcomas, in consequence of the natural tinting of their elements, were an unusully favorable subject for such investigations. The same condition has been frequently demonstrated in other tumors. After describing an exquisite case of enchondroma of the scapula, Virchow* says: "The propogation took place through the connective tissue, as has later been observed in a similar manner in other cases, and *as it is invaribly and very distinctly seen in enchondromas of the soft parts.*"

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* Morbid Tumors, vol. i. p. 490.

The radical removal of malignant or conditionally malignant growths of the tympanic cavity either from the glenoid fossa or from the external meatus or mastoid region may be an unusually difficult surgical performance, from which, however, in appropriate cases, we ought not to shrink. By chiseling the bony walls of the meatus and the outer plate of the mastoid process away, which can be, and has at least partially been, done with safety, we gain sufficient space for manipulations in the middle ear.

The literature on malignant intra-aural tumors is scanty. It is compiled by Schwartze at the end of his paper on "A case of primary epithelial cancer of the middle ear," in the ninth volume of the *Archiv. für Ohrenheilkunde*, p. 208, etc. 1875, and in his "Pathological Anatomy of the Ear;" translated into English by G. O. Greene, p. 29, etc. 1879. It comprises nineteen cases, to which is to be added a case of primary epithelial cancer of the petrous bone by Lucæ (*Arch. für Ohrenh.*, xiv, p. 127) 1878, and the case of Delstanche (*Arch. für Ohrenh.*, xv. p. 21) 1879, though it originated in the external auditory canal. Since Schwartze gives only the bibliography of the cases with notes on some of them, it would be a thankful task critically to review them as to their origin, course, termination, nature, and treatment. Such a review, apart from its scientific value and usefulness, could scarcely fail to lead to some practical suggestions as to the operative removal or destruction by caustics and heat of these otherwise invariably fatal affections.

The parotid tumors are briefly, but very instructively described by Paget (*Lectures Surg. Path.*, i. p. 201), etc.; exhaustively, however, and with a very extensive bibliography they are treated by Virchow in his large work on tumors, in the chapter Chondromata (vol. i. p. 435, etc). In this place the old controversy as to the origin of the tumors in the region of the parotid is clearly discussed on the basis of many observations and researches, and I beg leave to quote from it a passage bearing upon the case under consideration. On page 512, Virchow writes: "Bruns who maintains the extra-glandular origin of a part of the so-called parotid enchondromas, states that just the sub-auricular enchondromata originate in the gland. Possibly these contradictions will be solved by the demonstration that some of the enchondromas in this region are of extra-glandular, others of intra-glandular origin. This supposition is supported not only by decided statements of authors, but also by the fact that the same region is the favorite seat of subcutaneous myxomas, fibromas and kystomas. At any rate my own investigations prove beyond a doubt that the intra-glandular origin of enchondroma occurs in its most perfect type just in the salivary glands."

ON SCLEROSIS OF THE MASTOID PROCESS.

By Dr. ARTHUR HARTMANN, Berlin.

Translated by JAMES A. SPALDING, M.D., Portland.

I HAVE already pointed out in a paper "on the perforation of the mastoid process," (V. Langenberck's Archiv, Bd. xxi, H. 2), great variations exhibited in the development of the cell-spaces of the mastoid process, since in some cases the bony foundation, in others the cells predominate. At the same time, I have claimed that we may find hyperostotic processes without demonstrable pathological causes. While Bezold * says that we may often find in aged people that the mastoid process consists of compact substance without air-cells, excepting the antrum and its adjoining cells; Wildermuth † maintains that mature age has no constant influence upon the expansion or contraction of the cells. In seventy adult skulls of varying ages, I found but one pronounced hyperostosis of the mastoid process, and on one side only, while on the other there were air-cells. On the other hand, inflammatory processes which spread from the tympanum to the mastoid process, may often lead to a hyperplasia of the bony foundation, and so to complete sclerosis. Such cases are frequent, but not often reported. Schwartze ‡ says: "Sclerosis is a frequent sequence of chronic purulent inflammations of the middle ear, the cells gradually contracting and finally

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* *Arch. für Ohrenhlkde.*, xiii. p. 48.

† *Zeitschr. für Anatomie und Entwickelungsgesch.*, ii. p. 331.

‡ *Handbuch der patholog. Anatomie. Klebs. Gehörorgan.*

disappearing; the diploe also between the external and internal tables at the top and inner walls of the process becomes filled with bony masses. The corlicalis also becomes thickened by deposit of bone on the outer surface."

Sclerosis is most often observed during operations on the mastoid, rendering them difficult or hindering an entrance to the antrum. During post-mortems, but slight attention is usually given to the state of the mastoid process* although more should be given considering the importance of sclerosis to our prognosis of the morbid process complicating inflammations of the middle ear, as well as in reference to operations on the mastoid process.

Experience and observation show that sclerosis may be of two varieties; first, as idiopathic, chronic periostitis, and ostitis interna of the mastoid process, developing itself after the cessation of a tympanic inflammation: second, as a morbid process developing itself side by side with an inflammation of the tympanum, and then remaining stationary or advancing simultaneously with the advances of the latter.

I. Idiopathic chronic sclerosis of the mastoid process.

CASE I. *Inflammation of both middle ears in the course of typhus abdominalis, with persistent, violent pains in the mastoid region after the fever had ceased. Death from phthisis pulmonalis. Sclerosis of both mastoid processes.*

W., æt. 26, two years before her death had an attack of typhus, with development of otorrhœa on both sides, and later of a lung disease of which she died. Violent pains persisted in both ears after the typhus, and were operated for in the left ear, a large amount of pus being discharged from the meatus after the puncture. For a fortnight after, the patient suffered from very violent pains, and repeated convulsions ensued. These pains have appeared at various periods since, lasted eight to fourteen days and then again abated. Independent of these pains she had often had otorrhœa with evacuation of a slight amount of purulent secretion.

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* Moos: (*Arch. für Augen und Ohrenheilkunde*, Bd. i, 224), in speaking of an autopsy says: "The cells in the perpendicular portion of the mastoid were but little developed. This condition is frequent after chronic purulent inflammation of the middle ear, and is due to chronic inflammation of the lining of the cells."

On presentation, the patient was in the midst of a renewed attack of pain in both ears: secretion from the ears was absent; the right memb. tymp. was still preserved; in its centre a depressed translucent spot. The left memb. tymp. had a perforation in the anterior lower quadrant through which the reddened mucous membrane of the labyrinthine wall could be seen. Hearing: *L*, watch 10 *cm.*, *R* 18 *cm.*: voice, *R* 8 *m.*, *L* 1 *m.* The mastoid region was slightly red and barely sensitive to pressure. The pain was described as below the surface of the mastoid process. During a long stay at the hospital the pains came and went, narcotics being of no avail. The patient being now far gone in phthisis, the operation that might have relieved the pains was abandoned.

The post-mortem examination showed the usual changes in the tympanum after purulent inflammation. Two vertical sections were made through the mastoid process, one 6 *mm.*, the other 12 *mm.* behind the spina. The posterior segment showed the antrum of normal size and completely surrounded by a sclerosed ring of bone, 6 *mm.* thick. The cell system was only indicated by a few small spaces resembling spongy bone-tissue. The sclerosis of the anterior segment extended to the outer surface of the process, and the bone between the antrum and meatus was completely sclerosed. The walls of the right antrum were covered with a small amount of muco-serous fluid, and the cells were sclerosed with exception of a few cavaties varying in size from that of a pea to that of a pin's head. The outer surface of both mostoid processes was healthy.

This is the first case, I believe, where the autopsy has proved that, without inflammation in the tympanum, without pus in the mastoid portion, and without distinctive disease of the bone, the most violent pains may ensue, so violent that had the state of the patient allowed, I would have perforated the mostoid process.

Dr. Wendt's experience seems to help us in judging the origin of this disease to be an inflammation of the mucous membrane of the air-cells, leading to sclerosis of the bone. A review in *Archiv. für Ohrenhlkde.*, vi. 293, says: "Dr. Wendt often saw at autopsies the cells of the mastoid process filled with their swollen mucous membrane, so that their cavities were quite abolished. It seemed as if the mucous membrane must be tightly squeezed and that this state was probably accompanied by violent pains. In one case during acute purulent inflammation of the middle ear, where the pains had lasted weeks, and were attributed to the mastoid region, he suspected pus and operated with Middeldorf's acido-peirastic drill. Although the cavities in the bone, such as they were, were opened, no pus was evacuated and there was no demonstrable communication between the wound and the tympanum."

We cannot doubt but that the sclerosis is developed by such a morbid process as Wendt observed, and which seems analogous to the densifying ostitis (Volkmann), of other bones of the body. The excessive pains are caused by the persistent inflammation in the bone, sometimes giving the patient the most terrible anguish. Our operative experience proves that these pains are caused by the morbid process in the mastoid portion. Just as Wendt relieved the pain by boring at an early period of the disease, and hastened a cure, our experience proves that a simple boring into the mastoid process without opening a cavity or evacuating a secretion can stop the inflammation and make the symptoms cease. Buck reports similar cases (*Archives of Ophthal. and Otol.* iii. 172), and Schwartze's forty-seventh case *Archiv. für Ohrenhlkde.*, xiii. 249), is very instructive. This was the case of a woman who had had otitis acuta. A few weeks later, she suffered from violent inflammatory pains in the mastoid process, which were in vain opposed by repeated incision down to the bone. The tympanum and memb. tymp. were free. The mastoid process was chiselled on account of suspected pus. Neither cavity nor pus were found in the very hard bone, even at a depth of 2 *cm.* The operation relieved the pain completely. Schwartze and others have in the same way relieved pains localized in the mastoid process, in connection with inflammatory processes in the tympanum, without even opening the antrum or evacuating pus.

To sum up:

Sclerosis can appear as an idiopathic disease of the mastoid process, after cessation of inflammation of the middle ear, and cause the most violent pains:

Practice proves that the symptoms of violent pains, in connection with idiopathic sclerosis, can be relieved by opening the mastoid process.

II. Sclerosis as a complication of inflammatory processes in the tympanum.

CASE 2. *Inflammation of the middle ear lasting for years with repeated acute exacerbations. Death from purulent meningitis and abscess of the brain. Cholesteatoma in the tympanum and antrum; sclerosis of the mastoid process and caries of the roof of the tympanum.*

Dorothea M., æt. 34, had had otorrhea, *left*, since childhood, and suffered repeatedly from violent pains in the ear, which would disappear after a few weeks. During nearly every subsequent summer, she had one or more attacks of excessive discharge from the ear, with the same pains. During these attacks she could do no work, and tried bleeding, blisters, etc., etc., on the mastoid process where the pain was most violent, but all in vain. There was never any swelling behind the ear. She complained at intervals, of dulness of the head and pain in the left temple. Six weeks before entering the hospital, she had chills and feverish symptoms, and an intense pain in the left temple, but no convulsions or cerebral symptoms. After application of ice-bags to the head for eight days, she went to housework again, with a dull pain in the left temple. Four days before her second reception to the hospital, the symptoms returned as before with delirium and unconsciousness, which lasted till December 18, 1877, when she was brought to the hospital, where she died on the following day after exhibiting marked cerebral symptoms.

At the autopsy, the anterior portion of the left hemisphere was found covered with pus, which extended to the base of the brain. The dura mater over the left tegmen tympani was discolored, and pierced by a few openings, beneath which a cavity full of pus was seen. The pus being removed, the tegmen was found to be perforated by a few small orifices which led into the tympanum. An abscess in the brain was discovered, corresponding in situation with that over the tegmen, and extending into the lateral ventricle, which, with the right and middle ventricle was filled with purulent fluid. The rest of the brain was normal, but the whole spinal cords was surrounded by pus, resting on the pia mater and extending on the roots of the nerves to their exit.

A vertical section was made through the mastoid process behind the auricle, and the anterior wall of the tympanum was removed with preservation of the memb. tymp., and the contents of the tympanum. The memb. tymp. was intact with exception of a small opening above and behind. The sulcus tympanicus had suffered from slight carious loss of substance at a spot corresponding to the opening in the memb. tymp., and this cavity was filled with a polypus springing from the mucous membrane of the tympanum just in front of the entrance to the antrum. The antrum was full of whitish scales, and had increased in size. Both tegmen and antrum were perforated by small openings which led into the middle cranial fossa. The enlargement of the antrum had reduced the thick plate of bone (3–4 *mm.*) between the antrum and the meatus to a mere translucent shell.

The scales in the antrum and tympanum were examined microscopically, and found to be composed of large epidermoid cells, with a few crystals of cholesterin, such as are peculiar to cholesteatoma, or pearl tumor, of Virchow.

The mastoid process in the neighborhood of the antrum was completely sclerosed, the whole portion between the outer wall of the antrum and the surface of the mastoid process being especially free from cells, while the summit showed only a few traces of network tissue.

CASE 3.—*Chronic otorrhœa on the left side: Caries of the petrous bone: Entrance of pus into the posterior cranial fossa: Meningitis purulenta: Small abscess of the brain.*

S. E., a glazier, æt. 30, had had otorrhœa, *left*, for fifteen years. Three weeks before his death he was attacked with violent pains in the left half of his face, which led to facial paralysis; later, he suffered from extreme pain in the whole head. The left facial nerve could not be excited. Pus discharged from his left ear. A perforation in the memb. tymp. was filled with a polypus. The temporal bone was not particularly painful. The autopsy showed purulent meningitis of the posterior cerebral fossa and an abscess as large as a walnut in the left cerebellum.

A vertical section was made through the mastoid process between the posterior wall of the meatus and petrous bone, and he tegmen tympani was removed. The bony wall of the facial canal was wholly destroyed at its point of curvature, and from this spot, two carious passages led backward, separated from the middle cranial fossa by a thin plate of bone. The outer passage ran backward in the angle formed by the upper vertical and horizontal canals, the other ran over the promontory and inward from the upper semi-circular canal, while both were united, in that the bone embraced by the upper semi-circular canal was also destroyed by caries, showing a passage as large as a quill. The canal itself was preserved, and enclosed in bone that was still 1 *mm.* thick. The carious canal embraced by the semi-circular canal continued inward, and led by many small openings towards the posterior cranial fossa, into a triangular fissure, near the meatus auditorious, the hiatus subarcuatus of v. Tröltsch.

The mastoid process was completely sclerosed, with exception of a small cavity very near the antrum. The base of the middle cranial fossa was a little lower than the linea temporalis, which I regard as a depression of this fossa.

CASE 4.—*Otitis purulenta dextra for years: Caries and necrosis of the petrous bone: Selcerosis of the mastoid process: Meningitis purulenta: Thrombosis of the sinus transversus.*

George H., æt. 13, had otitis purulenta since infancy, and a fortnight before his reception to the hospital (June 10, 1878) had all the symptoms of meningitis. The mastoid region began to swell and was incised, evacuating discolored and offensive pus. The symytoms continued unabated, and the patient died on the tenth day, after delirium and coma.

The autopsy showed yellowish, circumscribed patches of pus scattered over the surface of the brain, and extensive patches of purulent infiltration at the base of the brain, especially at the right side at the cerebellum. A large abscess cavity was found near the angle of the temporal bone, spreading over the middle cranial fossa, and a portion of the posterior surface of the petrous bone. Pus was also found beneath the dura mater of the sella Turcica and left, middle cranial fossa. The transverse sinus contained purulent masses and thrombi. A section of the mastoid process was made 8 *mm.* behind and parallel to the posterior wall of the meatus. A large part of the tegmen tympani was necrosed. A carious canal as large as a quill ran from the tympanum beneath the labyrinth, and its anterior wall was but 2 *mm.* distant from the carotid canal. It led into a cavity close behind the transverse sinus, and a few minute canals could be seen leading backward from the cavity. The whole region surrounding the antrum mastoideum was found completely sclerosed.

Three of these cases showed both sclerosis of the mastoid process, and caries in the tympanum: in Case 1, perforation of the tegmen tympani, and in Cases 3 and 4, carious canals leading to the posterior cranial fossa. The question, therefore, that we have to consider is, whether we could here have interfered therapeutically and saved life.

In Case 2, we might have removed the polypus and cholesteatoma by forcible syringing, and so prevented death,* or we might have opened the mastoid process exposing the antrum and tympanum, which could best have been done by chiselling away the posterior wall of the meatus, and so gained a cure. We cannot conclude from this single case, that the frequent acute exacerbations, with pain and inflammatory symptoms, indicate the need of an operation. Bezold's case † goes to show that under similar circumstances, we may have a spontaneous cure, in so far as the cholesteatoma eat away, in an outward direction, the capsule of bone by which it was surrounded. Bezold made an incision into the bulging posterior wall of the meatus, and found the bony wall wholly eaten away, so that the cholesteatoma could be removed through the opening. In our case, however, the wall was only eaten away to a thin plate; the process extended towards the interior of the cranium, before it had penetrated into the meatus. Hence we cannot rely upon such a spontaneous cure, but must interfere operatively as early as possible; *i.e.*, as soon as we suspect cholesteatoma, and cannot remove it in the usual way.

In Case 3, a polypus resting in the perforation of the memb. tymp. probably retained the secretion which favored the development of the destructive process. An early removal of the polypus and secretion might have prevented death. The extension of the caries is especially interesting in that it advanced towards the posterior cranial fossa, along the vessels coursing beneath the upper semi-circular canal, and which run from that fossa to the middle ear. These vessels arise from a deep groove, which in early life curves forward from the posterior cranial fossa beneath the upper semi-circular canal. In later life, this groove is only indicated by the hiatus subarcuatus. V. Tröltsch* believed that in one case, these vessels had a decided share in transmitting the inflammation from the interior of the temporal bone to the cavity of the skull, and mentioned similar cases seen by Voltolini and Odenius. Case 4 could not have been one of caries due to retained secretion in the tympanum, for the memb. tymp. was destroyed. An artificial opening of the mastoid process before the appearance of the meningitis, might have removed the symptoms due to sclerosis, but could not have laid bare the carious canals leading from the tympanum, or made them accessible to cleansing or disinfecting fluids.

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* In syringing the tympanum and antrum to remove thickened masses, I use a German-silver tube bent at a right angle near its end, and introduced into the tympanum under control of the mirror. An India rubber tube unites the silver tube with the syringe, so that the to and fro motion of the syringe during its use is not communicated to the tube, lying gently in the tympanum.

† *Archiv. für Ohrenhlkde.*, iii.

In all four cases the sclerosis limited itself to the interior of the mastoid process, and it was impossible to demonstrate any deposit of bone, or increase of volume in any direction. This fact is worth remembering, that in making an artificial opening into the mastoid process, we are not as a rule to expect to find any deposit of bone on the surface. In these cases, therefore, we cannot penetrate deeper than the normal anatomical relations allow, if we would avoid opening the labyrinth, and wounding the facial canal as, practically speaking, Schwartze once did in penetrating 3 *cm.* forward in a case of sclerosis.

As regards the limits of the operation to avoid opening the cranial cavity and sinus transversus, I must coincide with Bezold in laying stress on the frequent occurrence of an excessive curvature of the sinus, and I have also succeeded by making my sections perpendicular to the axis of the auditory meatus, in fixing the relations of the middle cranial fossa in the operation. As the canal that I fixed on the cadaver for operation with the drill* proves too narrow for operating on the living, Schwartze enlarges the canal, Wolf proposes that we chisel the posterior wall of the meatus, and Bircher of Aarau (*Inaug. Dissert. Bern*, 1878) has drawn the conclusion that we must proceed in every case according to the state of the parts concerned.

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* *Archiv. für Ohrenhlkde.*, iv. 128.

In Cases 2 and 3, where an abscess of the brain ensued, it should be noted as important, that the memb. tymp. was almost entirely preserved, and the existing perforation filled with a polypus. Hence there could be no doubt but that the secretions were retained, inducing probably the destruction of the bone, and the appearance of the abscess; at all events favoring its development. Lebert, in his work on abscess of the brain (*Virchow's Arch.* x) says that we cannot make it a rule, that brain symptoms appear after suppression of an ear discharge. I would add that an otorrhœa may continue, and yet the secretions may be retained. It seems in many cases, when the perforation is not completely stopped up, as if a sort of filtration took place, the firmer constituents of the secretions remaining, and the fluid constituents continuing to escape.

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*Schwartze (*Archiv. für Ohrenhlkde.*, xiii. 95) thinks it "very surprising" that I recommended an auger-shaped instrument for opening the bone. Any one who looks over my article will see that I mention expressly "that the same spot must be chosen when a chisel is used." I have therefore left the choice between the drill which Jacoby recommends as harmless, and Schwartze's chisel.

ON A TRAUMATIC, MOVABLE HAEMATOMA OF THE MEMBRANA TYMPANI.

By Prof. S. Moos, of Heidelberg.

Translated by James A. Spalding, M. D., Portland, Me.

October 26, 1878, C. R., æt. 48, a locomotive engineer was seen for the first time and gave the following history :

While driving an engine August 22, 1878, an empty bottle was thrown from a train going in the opposite direction, hitting him obliquiely on the left cheek, temple and auricle, but causing merely an external abrasion of the skin of the cheek and upper third of the helix. Ever since then he has had continuous tinnitus in the left ear, dizziness towards the left, and head-aches. The hearing was completely lost.

October 26th. The right ear showed injection of the vessels of the manubrium, and opacities of the mucous membrane of the memb. tymp. Left, an ochre-yellow, concave and oval discoloration was seen occupying the posterior and upper quadrant of the memb. tymp. and giving the impression as if it were seen on the labyrinth wall through a very thin memb. tymp. On rarefying the air in the meatus, this spot moved distinctly, so that there could be no doubt of its *seat in the memb. tymp. itself.* The light spot was absent, and the mucous membrane slightly opaque. The patient suffered from excessive nasal catarrh.

Hearing : whisper, both ears, 0 : Loud voice, *R*, 1 *m*, *L*, 0 : Acoumeter both, 0 : Bone conduction for acoumeter 0 : for tuning fork A, 0 : for C′ and C″ on *R*. only.

Both ears, therefore, had probably been affected previously to the accident, and probably from a chronic catarrh of the middle ear of both sides in varying degree. Leaving aside the possible alterations caused by this disease, our diagnosis for the left ear, rested on a traumatic blood-extravasation (now undergoing transformation) into the layers of the posterior and upper quadrant of the memb. tymp., and a simultaneous lesion in the labyrinth—perhaps another extravasation—since the hearing on the wounded side was wholly lost.

The patient used the following prescription till December 7th, in tablespoon doses three times daily : Potass. iodidi 5.0 ; potass. bromidi 15.0 : aquae destil. 200.0. *During the following treatment, lasting many weeks, the left ear was spared all local treatment.*

Injections of zinc 0.60 : 100 were applied every few days, *R.* by the catheter and in ten days H. was 2 *m.* for voice. November 5th, the tuning fork *a* was heard *L.* for the first time at 3 *cm.* ; for voice 1 *m.* ; and soon after 2 *m.* In the mean time a severe angina tonsillaris set in, and was treated with argent nitr. 1:30, and alum as a gargle. The nasal douche was also employed from time to time. The oval, yellow spot moved backward gradually, a portion seemed to extend to the upper wall of the meatus, and the portion of the memb. tymp. between the posterior border of the manubrium and the anterior border of the exudation assumed a normal appearance.

November 19*th* : H. *L.* voice 4 *m.* Tuning-fork *a* 3 *cm.* C′ 5 *cm.* C″ 10 *cm.* Bone conduction for C′ and C″ with left ear closed.

November 21*th* : H. *L.*, voice 5 *m.* The colored spot was punctured and the contents being examined microscopically, proved mostly yellow, homogeneous, clotted and fibrous, containing a few reddish-brown crystals of haematoidin.

December 3*d* : H. *L.*, voice 11 *m.*

December 5*th* : whisper, *R.*, 1 *m.*, *L.*, 50 *cm.* Voice *R.* 13 *m.* *L.*, 11 *m.*

December 10*th* : whisper, both, 1 *m.* Acoumeter, both, 4 *cm.* The tinnitus is constant but diminished in intensity. The vertigo, of which he had several attacks during the treatment indicated, has almost disappeared. The extravasation of blood lies very eccentric, a smaller portion still on the posterior periphery of the memb. tymp., but still united with the larger part which lies along the neighboring part of the meatus. As the hearing remained alike in both ears, I supposed it now to be about as good on the left side as before the wound, and so suspended treatment. I could not make up my mind to local treatment of the left ear, so long as the vertigo and subjective tinnitus were still present, referring them as I did to a lesion of the labyrinth, because they had not been present before the accident.

Traumatic influences usually cause a rupture of the memb. tymp., and more or less violent bleeding, which in our case was absent, while the rupture took place between the lamellæ, but whether between all of them we were unfortunately unable to decide. At all events this was a hæmatoma of the memb. tymp. with its fluid constituents wholly absorbed in the two months that had intervened between the time of the accident and the patient's first visit.

The horizontal wandering of the exudation deserves still higher interest, considering its firm consistency, and corresponds with cases seen by v. Tröltsch and Politzer; the former being the first to call attention to wandering pigment spots of the memb. tymp. from the posterior half towards the meatus, while Politzer noticed the wandering of an india-rubber eyelet to the periphery of the memb. tymp. I will mention a similar case: February 19, 1878, I made a paracentesis in the lower quadrant for a serous exudation into the tympanum, and afterwards saw the circular scar wander upward over the short process to Shrapnell's membrane, when the patient no longer reported. In this present case, considering the tests of hearing, the vertigo and subjective noises which had never been present before the wound, there can be no doubt of a simultaneous lesion of the labyrinth. A simple concussion cannot be admitted, for the functions were still totally absent two months after the wound. It is much more probable that there was a simultaneous extravasation of blood in the labyrinth also, with more gradual and slower resorption of its fluid constituents.

This view would explain on the one hand why at least some improvement in the symptoms ensued; on the other hand the supposition of a continuance of similar remains of the exudation, as in the memb. tymp., would teach us in regard to the persistence of a portion of the symptoms, such as tinnitus, vertigo, etc. Whether these will disappear with time, is conjectural. From my experience, so far as concerns the total disappearance, or the improvement of the disturbances in the organ of hearing ensuing upon traumatic influences, I must confess that I was astonished at even the proportionally slight improvement that ensued. For I have as yet never seen an improvement, or rather a perfect cure, in any case of *traumatic* lesion of the labyrinth, no matter what the treatment employed. Every one will surely agree with me in shunning all treatment of the middle ear of the wounded side.

If I had been requested to give a legal opinion I should have been forced to say that the wounded organ at the time of the wound was in the greatest probability no longer in a normal state. The negligence of the person who threw the bottle would have been none the less, although the damages so far as concerns lasting injury, etc., would from this very probability have been much milder.

Judging from my own experience in one-sided wounds of the ear, which become the subject of legal damages, I cannot too urgently advise accurately to test the functions of the unwounded ear. If this were always done, we should not so often be guilty of a sin of omission to the great prejudice of the defendant.

It is very doubtful if our patient ever drives a locomotive again, owing to his inclination to vertigo, leaving entirely out of the question his diminished hearing.

SYPHILITIC DISEASES OF THE INTERNAL EAR. BEING A REVIEW OF SOME RECENT PAPERS UPON THIS SUBJECT.*

By D. B. St. JOHN ROOSA, M.D.

In 1877, I published some cases of what seemed to me to be a disease of the ear, chiefly if not entirely affecting the labyrinth. I even ventured to express the opinion that the principal seat of the lesion in these cases, was probably to be found in the Cochlea, and the name Syphilitic Cochlitis was given to the disease.†

Lest I might be misunderstood as supposing that diseases of the *internal* ear of syphilitic origin, were more common than those of the *middle* ear from the venereal disease, when incorporating this paper into the last edition of my work on the ear, it was stated that "it should not be forgotten that syphilitic affections of the middle ear are perhaps more common than those of the labyrinth." This point is made early in the discussion in order that the statement made in the beginning of one of the papers I am about to review may be met in advance. This statement is, "the prevailing opinion has been that the seat of the lesion is usually in the labyrinth." I do not think that the prevailing opinion of our day has been, that the seat of the lesion of the ear in syphilis is usually in the labyrinth, but rather that it is sometimes, perhaps *often*, found there, and in the cases of "sudden deafness" almost always.

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* The Relations of the Conducting Mechanism of the Ear to Abnormal Hearing. By Samuel Sexton, M.D. Transactions of the American Otological Society, 1878. Syphilitic Affections of the Ear. By Albert H. Buck, M.D., American Journal of Otology, vol. i, no. 1. The Sudden Deafness of Syphilis, with Cases. By Samuel Sexton, M.D. American Journal of the Medical Sciences, July, 1879.

† *Medical Record.*

In January, 1879, Dr. A. H. Buck published a paper upon "Syphilitic Affections of the Ear." In this interesting article, Dr. Buck makes four distinct classes of these cases : 1st, those of the auricle and auditory canal ; 2, of the middle ear ; 3, of the auditory nerve ; 4, of the middle ear and auditory nerve. At the close of his article, after having given cases that seemed to belong to each of these heads, Dr. Buck makes use of the following qualifying language : "With regard to the cases in which the auditory nerve, either before or after its entrance into the labyrinth, is the part believed to be principally affected by the constitutional disease, I find again that my material is far too scanty and too imperfect to justify any special conclusions. In these cases it is generally assumed that the labyrinth is the seat of the syphilitic lesion. It is quite possible, however, that the lesion may be in the middle ear, or in the auditory nerve before it enters the labyrinth." * * * "Lesions at the oval window, by obstructing the actions of the stirrup, would likewise be competent to diminish very materially the power of hearing."

The author further states that lesions in the meatus auditorius internus and in the minute openings of the *cul-de-sac* of the meatus and in the bony channels of the modiolus, might produce changes in the functional capacity of the filaments of the auditory nerve. The conclusion is then reached, apparently in contradiction of preceding statements, that "we are hardly justified in using the expression labyrinthine disease, except in those cases where demonstrable lesions are found in this part of the ear at the post mortem examination. At the same time, it is difficult to suggest a better term even for temporary purposes."

In the July number of the *American Journal of the Medical Sciences*, Dr. Samuel Sexton published an article entitled "The Sudden Deafness of Syphilis, with cases," in which, after the opening statement, that has already been quoted, it is said that "Better knowledge of the disease (syphilis of the ear) seems to lead to the conclusion that its chief, if not entire location, is in the middle ear and its conductive mechanism." This paper is a sequel of one published in the *Transactions of the American Otological Society* for 1878, by the same author, for there, at the close of an argument against the idea that the labyrinth is often the seat of the disease, it is asserted in italics that the "sudden deafness of syphilis has, beyond doubt, its principal seat in the conducting mechanism."

In the *Medical Record* for September 20, 1879, Dr. Sexton's views are reproduced with all the *ex-cathedra* importance of an editorial article, and a review of a book upon the Ear, with the same inspiration and the same dogmatic assertions in regard to this subject, has just appeared.* These are evidences of a systematic attempt to establish, upon the dictum of one author, questions, which, to say the least are not yet settled, and about which there is yet room for difference, however strongly it may be asserted that "better knowledge" has overthrown the opinions of those who believe that the labyrinth and the auditory nerve are sometimes the seat of a lesion in syphilis, which causes sudden deafness. I have felt bound to go over the whole subject carefully again, and determine if possible, whether it was time for those of us, who had believed that syphilis does sometimes invade the labyrinth and auditory nerve to change our views. As the best way of reaching the subject, I shall review Dr. Sexton's papers, in as brief a manner as the subject will allow.

After the statements already quoted, the paper continues with a reference to Mr. Saunders' views on this subject.

Saunders was perhaps the best authority of his time, but his means of diagnosis were poor, and his cases are not reported with sufficient exactness to make them of any value whatever in this discussion. They simply show that certain persons were relieved of impairment of hearing and tinnitus, after using mercury and sarsaparilla. He is however forcibly struck with the congruity of deafness produced by syphilis, and that which was generally described in his time as nervous deafness. Granting that Saunders' cases of nervous deafness were really such, there is some value in his argument ; but, as I have intimated, we are obliged to reject his testimony because in common with the old authors, until the time of Wilde, the data from which his opinions are formed, are not given with sufficient exactness. So far as they go, they are decidedly against Dr. Sexton's views. Iconoclastic as it may seem, I think it would be better for science if all otological literature up to the time of Wilde were rejected, except so far as it may have a historical value in telling of the failure of the ancients to make exact observations in this department. Of course I am here speaking of therapeutical literature, and not of the anatomical works of Eustachius, Valsalva, Monro, and a few others. It would save a great deal of type if we began our discussions with the opinions of the men who first observed aural disease in a thoroughly objective manner.

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* *American Journal of Otology*, vol. i, no. 4, p. 292.

Sir William Wilde is next quoted by Dr. Sexton at some length as an author who sustains his view, or to put it in the writer's own words, he "more nearly approached a solution of the syphilitic affections of the tympanum," which this paper is intended to describe. Again, "but his description comes very near reaching the disease, as it is now believed to exist in the middle ear." Wilde describes "an inflammation of a specific character occurring in the membranes of the tympanal cavity, but chiefly exhibited in the external membrane of the drum."

Dr. Sexton after these words, quotes Wilde as regarding this disease as an affection of the *membrana tympani only*. This is a mistake, for as I long since showed, although Wilde called affections of the middle ear by the name of myringitis, because he believed the *membrana tympani* was chiefly affected, he never was so ignorant of pathology as to suppose as is said here, that this membrane *only* was affected. He knew perfectly well that his chronic myringitis was an affection of the middle ear. Wilde's language is "The disease which I am about to describe is an inflammation of a specific character, occurring in the membranes of the tympanal cavity, but *chiefly exhibited* in the external membrane of the drum."* Whatever Wilde may have thought, he is far from denying that there may be a syphilitic cochlitis, or inflammation of the labyrinth; he is simply describing a disease of the middle ear. He not only came "very near;" but he actually described cases of deafness, arising as he thought from lesion of the middle ear only, some twenty-five years before our time. There is no evidence as to what he thought of the possibility of syphilis invading the labyrinth. I do not think that he can fairly be quoted in such a discussion as this, for he seems to have expressed no opinions germane to it.

Since the time of Wilde however, I believe we have been able to classify aural disease more accurately, and consequently that we have been able to recognize some well defined affections of the labyrinth from syphilis and other causes, in a much clearer manner than had before been done.

Schwartze is the next authority quoted, and this is to show that nothing has been done by pathologists in the lesions of the labyrinth. The words quoted from Schwartze are, "what has been done by some in this field of late years with the most earnest endeavors, is scarcely more than a sad dilletanteism, and has no value for science."

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* Aural Surgery, London, 1853, p. 261.

I think this isolated quotation of Schwartze gives an unfair idea of his opinions. It is taken from the introduction, and the qualification "some" shows of itself that Schwartze believes that good work has been done even in the pathology of the labyrinth, for if we turn to page 156 (of the translation), we find a classification of the diseases that cause hyperæmia of the labyrinth. They are "typhus, puerperal fever, acute tuberculosis, etc. It may occur in acute and chronic inflammations of the tympanum, in meningitis and congestions, in disturbances of the circulation from various causes, and also from disturbances in the vaso-motor innervation." Dr. Sexton also quotes Schwartze as saying that even in the most acute affections of the tympanum, a simultaneous hyperæmia of the labyrinth *is* met with only exceptionally. What he actually says is this : "*From my own anatomical investigations* a simultaneous affection," etc., "*was* met with only exceptionally." He is very far from asserting that others may not have met with it. Indeed, he states in a foot-note to the very sentence quoted by Dr. Sexton, that Hinton, an author who needs no approval of any otologist, has met with hyperæmia of the labyrinth forty times. Then again in Dr. Sexton's quotation of Schwartze's opinion, that an independent and primary, non-traumatic inflammation of the membranous labyrinth has not yet been anatomically and certainly demonstated, the foot-note is omitted in which Biechy and Batissim claim to have found such an inflammation on dissection, and Schwartze's opinion that "from clinical observation it is probable that an acute primary and independent inflammation of the inner ear occurs not infrequently" is also omitted. But more than all this, Schwartze, l. c. p. 158, gives a case which was under his observation in 1877, and which afterwards came to dissection, which, to use Schwartze's own language, "places the existence of a *primary acute purulent inflammation of the labyrinth* without suppuration of the middle ear beyond all doubt."

But whatever Schwartze may say, good work has been done by several men in investigating the lesions of the labyrinth. They have shown that the membranes of the labyrinth may and do undergo thickening, atrophy, that hemorrhage may occur into the labyrinth, that gummy tumors may occur in the meatus auditorius internus. Granting this, it seems to me almost absurd to believe that in certain syphilitic cases, like aural lesions may not possibly have occurred. Is it probable, nay, possible, that the labyrinth has been entirely excluded from the effects of syphilis, any more than have the retina, the optic-nerve, or the membranes of the brain ?

This is an important point in this discussion, for if I correctly understand the drift of Dr. Sexton's paper, he believes that we should not seek nor expect a lesion in the labyrinth, when we may possibly explain the symptoms by reference to the middle ear, and that we may nearly always thus explain them. But we are not entirely without positive evidence that the labyrinth is invaded in the course of syphilis. Moos reported* a case of secondary syphilis, in which deafness, annoying tinnitus aurium and osteocopic pains in the skull were complained of. The hearing was rapidly destroyed. Death. At the autopsy the right external and middle ear were found intact, sclerosis of the petrous portion of the temporal bone, periostitis in the vestibule and small-celled infiltration of the membranous labyrinth, anchylosis of the stapes to the fenestra ovalis. Trunk of the acusticus unchanged.

Gruber has also reported a similar case.† The argument of the present writer has been, that if we observe symptoms such as were seen in cases where lesions of the internal ear were actually discovered on a post-mortem examination, and if we also find that the ordinary treatment for disease of the middle ear has no effect, while that which has been successful in brain lesions is also successful. here, we are justified in assuming that we are probably dealing with an affection of the labyrinth, although we cannot substantiate our opinion by an ocular examination of the parts involved.

We have no quarrel to make with Dr. Sexton's next statement, that a specific character may be "engrafted" upon a simple catarrhal inflammation, but we cannot agree with the inference that when a catarrh is modified by syphilis, sudden and absolute deafness becomes one of its symptoms. We know of no reason why syphilitic exudation in the middle ear any more than a catarrhal one should cause a sudden and absolute deafness. The pressure from a non-specific hyperæmia, catarrh, or thickening will be the same as that from a specific one. It is the situation of the lesion, and not its character that determines the amount of deafness. When we know that deafness must be very rarely absolute, unless the central organ be involved, just as we know that blindness can be very rarely absolute, unless the retina and optic nerve are affected, have we not a fair right to conclude that absolute deafness depends upon some lesion of the labyrinth or auditory nerve? In passing, we may call attention to the peculiar nomenclature of the paper under discussion. The author speaks of a (*non-purulent*) *mucous catarrhal inflammation of the middle ear*, by which is meant a catarrhal inflammation.

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* *Medical Record*, from *Centralblatt fur Chirurgie*, August 19, (77 ?), from Virchow's Archives.

† *Lehrbuch*, p. 617.

Now let us turn to the cases which are presented to prove that the sudden deafness of syphilis, is dependent upon disease of the middle ear. In case 1, a man of 42 is admitted to St. Francis Hospital, having had syphilis ten years before. He is weak and dizzy and staggers from side to side, and he has pains over his whole head. He has also facial paralysis on the left side. There is no record of any impairment of hearing for nearly three months, and then " deafness became a feature in both ears," whether suddenly or not, we are not told. Certainly all the evidence thus far makes it more likely that a disease extended from his brain to his labyrinth, than from his auditory canal to his drum-heads. He had had plenty of mennigeal symptoms. The deafness is nearly absolute, for it is stated that he cannot hear shouting. The physicians at St. Francis Hospital thought the patient had a brain tumor, and I think our readers will agree that he had some kind of brain disease. He now comes under the care of the N. Y Ear Dispensary, seven months after his admission to St. Francis Hospital. He still has facial paralysis, the uvula is drawn to the right side, and he still staggers. His drum-heads show nothing at all marked, he does not hear the tuning-fork well, not at all on the forehead ; he is placed on mercurial treatment, his drum-head is perforated, no fluid is found, and he is finally discharged. Two months afterward he is a little better as to his walking, but no better as to his hearing. This case is gravely reported as one of sudden deafness, dependent upon disease of the middle ear. The present writer can find no proof of what is claimed in the narrative of the case. What evidence there is leans very strongly in his mind towards disease of the labyrinth.

The second case is that of a man of 21, who had syphilis six months before, and woke up five months after the primary sore, with the discovery that he was very deaf. In a few days he could hear nothing. Later he had great pain in the back of the head which lasted for three weeks, during which time he was dizzy, and he had also dimness of vision. He perhaps hears some sounds in the right ear through a trumpet. The tuning-fork is heard when placed on the bones. Exhaustion of the air from both auditory canals, enables him to hear some words through a speaking-tube. He is put upon an active mercurial course. About three months after he passes from observation. His drum-heads, which were retracted and somewhat opaque, are said to be clearing. He cannot hear any words distinctly, however loudly shouted. Dr. Sexton evidently relies upon the fact that the hearing was very slightly improved at one time by rarefaction and condensation of the air in the external meatus, together with the changes in the drum-heads as proofs that the trouble was entirely in the middle ear.

The present writer prefers to believe that a deafness coming on suddenly, and attended by dizziness and staggering gait as well as frontal headache, is much more likely to have depended upon a lesion of the labyrinth, especially since as seen by the doctor's own notes, all the treatment of a mechanical nature directed toward the middle ear had no effect whatever. Now, if mechanical and structural changes in the tympanic cavity cause all these symptoms of central disease, is it not strange that local and mechanical treatment does so little for their cure. We are told that he was put upon an "active mercurial course." If this means what I fear it does not, that this patient received a thorough inunction treatment, together with iodide of potassium in increasing doses as delineated in my published cases, I would be satisfied that the patient had had every chance of recovery. In my opinion no patient with the symptoms that this one presented, would have been thoroughly treated with such prescriptions as are found recorded in the other cases used to illustrate this article. A lesion of the labyrinth is usually, I think, one of the later manifestations of syphilis. As such it will require a very prompt and energetic treatment to arrest it. Besides, the parts involved are so vital that delay in treatment, or inadequate doses of mercury and potash will allow the disease to go on unchecked until it has caused irreparable damage. And I think it probable, that the diseases of the peripheric parts of the body are not only of themselves apt to run their course with more rapidity, but also to be more quickly influenced by treatment than lesions of the brain and the labyrinth. What this may depend upon, if it be a fact, I cannot say. One of the proofs to my mind of the existence of a lesion of the labyrinth, is the fact that such symptoms as these delineated in Case 2, are only relieved by the most active and persistent "mixed" treatment.

The third case of "sudden deafness," reported in the paper under discussion, is one in which the patient stated that her deafness "came on by degrees, in rather a brief period of time." It was certainly a syphilitic case. She had attacks of dizziness, and she could not hear her own voice always when talking, and she is unable to regulate the pitch. These latter symptoms are those which Dr. Sexton in a previous paper has laid great stress upon as evidence of peripheric trouble, and I am quite willing to concede that they show disease probably of the Eustachian tube, and about the fenestra ovalis. But, this by no means excludes much more important changes in the deeper parts. One drumhead was punctured without any effect, except to increase the noises for a short time. She is put upon iodide of potassium, four gr. every four hours, and in three days she is less dizzy, and can hear her own voice most of the time. The patient then disappears from observation for six months, during which time she is said to have been treated for cerebral syphilis. She had several epileptiform seizures, and she took iodide of potassium in large doses. The hearing power scarcely underwent any change, and here the case ends. Certainly there is a strong suspicion that the blood-vessels of the brain were involved in this case, witness the epilepsy, and if those of the brain, why not of the labyrinth. This is, I think, not a clear case of "sudden deafness" from disease of the middle ear alone.

The fourth and last case quoted may be epitomized as follows: A man of 21 lost the hearing of one ear suddenly and absolutely with vomiting and dizziness. Iodide of potassium was given. Two years after, he lost the hearing of the other ear with the same symptoms and then Dr. Sexton saw him. He was anæmic, and had so much vertigo that he was attended when he was on the street. He had severe frontal headache, the pain extending to the vertex. He does not admit having had syphilis, and no positive evidence on that point is presented. There were evidences of sub-acute inflammation of the lower ends of the canals. He heard his own voice distinctly, but the distinctness varies. He does not hear an outside voice at all. The bone conduction is increased by closing the canals. Very low tones uttered close to his ears are painful. He hears all the notes of a piano up to middle C, after that he only distinguishes a rumbling sound. If this be not a symptom of disease of one part of the labyrinth, then our notions of the physiology of the organ of Corti must be revised. How often all of us have seen patients whose labyrinths have probably been ruined by cerebro-spinal meningitis, only able to hear the low notes of the piano. We have always supposed that they heard these, because the auditory nerve with its feeble powers was only able to perceive notes made up of very few and slow vibrations. There is no proof that this case was syphilitic, but we are willing to believe with Dr. Sexton that it probably was. It certainly was a sudden case, and its very suddenness is one of the arguments to prove that it is really one of disease of the labyrinth. Certain it is, that when labyrinth disease does occur, it is with just such symptoms as these. We can hardly imagine a man becoming suddenly and absolutely blind on account of an opacity of the cornea or lens, but how often does a hemorrhage into the sheath of the optic nerve, a plug in the central artery, or an exudation in the macula, destroy all but a glimmer of what we call sight. Just so in my opinion, it is hard to believe that sudden and absolute deafness attended by vertigo and vomiting, can depend on anything less than an exudation, hemorrhage, embolus or tumor, pressing upon some part of the auditory nerve. That other parts are soon involved, or at least, may soon become involved in such a morbid process, I should never think of denying. But, that peripheric disturbances alone can produce such a combination of symptoms I am not able to admit.

Having reviewed the histories of Dr. Sexton's cases I will pass on to the remarks and conclusions that follow them. The throat symptoms are admitted not to have been prominent "nor were the Eustachian tubes found to be obstructed in any of them."

The writer then goes on to remark that he inclines to the opinion that syphilitic lesions seldom if ever reach the middle ear from the throat. This is a view I cannot share. Both in children and in adults, in congenital and acquired syphilis, have I seen cases in which the hyperæmia and catarrh of the pharynx extended to the middle ear, and why should not a syphilitic catarrh as well as a non-syphilitic one creep up through the Eustachian tubes to the middle ear? Has syphilis such peculiar methods of extension that its inflammatory products pass around the ordinary channels to attack adjacent organs by a circuitous course? Dr. Sexton's argument seems to be that the tympanic cavity is not only the favorite and almost exclusive situation for syphilitic lesions of the ear, but that they reach this part through the drum head and auditory canal. If this be true, then the affections caused by syphilis are certainly unique.

Dr. Sexton also states that "we know of no cause which produces such peculiar and decided symptoms of deafness" as syphilis. If, by this extraordinary phrase "symptoms of deafness," vertigo and staggering gait are meant, I think that he is in error, for there are a number of causes, for instance the exudation occuring in the course of cerebro-spinal meningitis, mumps, and hemorrhages which produce symptoms very like those of the cases narrated here. It has long since been shown that even syphilitic iritis has no pathognomonic symptoms, and I have yet to learn that we can determine the specific cause of an attack of sudden deafness, by the symptoms, unattended by a history. Considerable stress is laid upon the discovery that in these cases there is a "pre-existing state of hyperæmia in the drums either from cold, or from a sympathetic irritation associated with some affection of the mouth or throat." If I understand this language, it is a direct contradiction of what Dr. Sexton has already said, in regard to the non-extension of syphilitic aural disease from the mouth and throat to the drums. For what is an inflammation of the drums caused by cold, or a sympathetic irritation associated with an affection of the mouth or throat, but an inflammation extending to the drums by the usual channels from the usual causes? Our author gives away, I think, a part of his case when he makes this admission, for he has just been claiming that the throat symptoms were not prominent, and he has tried to show that the drums were reached through the auditory canal.

We pass over the account of the pathology of syphilitic inflammation of the tympanum, for, while it is probably correct, it is open to the same criticism that has been so often made in regard to lesions of the labyrinth, that is, it is purely theoretical, and not founded on any post-mortem examination.

If Dr. Sexton will not allow those of us who believe from the subjective and objective symptoms, that there is a disease of the labyrinth, even if we are not able always to verify our opinion by an examination on the cadaver, neither can he be permitted to base an argument upon a theory that there is an exudation limited to the conductive apparatus, or as he would have us believe, mainly or, perhaps, wholly in the malleo-incudal joint. We are less willing to do this, since the lesion upon which Dr. Sexton lays so much stress, is one as yet scarcely found by the pathological anatomists. A study of Toynbee's catalogue will furnish the evidence upon this point.

Continuing his argument, Dr. Sexton thinks that the labyrinth in these cases is not greatly involved because the auditory nerve responds fully to the sounds conveyed to it, whether from the patient's own vocal cords or a vibrating tuning-fork placed on the skull. Let us see how the histories of his cases justify the use of the adverb "*fully*." In the first case, the tuning-fork placed on the teeth is heard best in the right ear, but when it is placed on the vertex and glabella it is not heard at all. Can it be possible, that the doctor considers this a full response to the sounds conveyed to the auditory nerve? There is no account as to how the patient hears his own voice, so no argument can be based upon this case. Now, I think that, if this man had had an affection which was even predominantly one of the middle ear, that is to say if the labyrinth was sound or slightly affected, the vibrations of the tuning-fork would have been heard on any part of the skull, and that its sound would have seemed to him to be very loud; in other words, it would have been intensified. If experience is worth anything upon this subject, it shows that it is especially in affections of the labyrinth that the tuning-fork is not heard at all on some parts of the skull, while in those of the middle ear alone its sound is always intensified.

Then again, in his first case "the patient cannot hear any voice, however loud,"—this is Dr. Sexton's own statement,—"not even shouting." To repeat my argument in a previous part of this paper, I again state that it is very hard, with the knowledge we now have, to believe, that any rigidity of the ossicles, any hyperæmia of the membrane of the middle ear, any amount of fluid in the tympanic cavity, any stricture of the Eustachian tube, or any combination of these conditions, would make a man so deaf that he could not hear any voice, however loud. I appeal to the judgment of those who have seen much aural disease, whether in their opinion anything but a central affection can cause impairment of hearing to such an extent as this? The analogies that I have already frequently used with regard to the affections of the external portions of the eye, as compared with those of the optic nerve and retina, in causing blindness, may be again recalled.

In Case 2, we find that "words shouted through a trumpet into the left ear are unheard," but the patient fancies that he can hear some sounds when the experiment is made in the right ear. "The tuning-fork is heard when placed on the cranial bones." There is no evidence furnished that he heard it fully, or as middle ear cases usually do, intensified.

Rarefaction of the air causes the second patient to hear some words through a speaking tube. This is one of the points upon which the author relies for his argument, of which I shall speak more fully subsequently, that the middle ear is chiefly affected when in any case, change in the density of the air in the external auditory canal alters the hearing power. On being dismissed from treatment, it is said that "he hears the tuning-fork as before, but he cannot hear words distinctly however loudly shouted through a trumpet." This case, from this part of the evidence, seems to have been a mixed one; that is, one in which there was considerable affection both of the middle and internal ears; but if we do not abandon our notions of naming diseases from the part chiefly affected, we should still class this as predominantly one of the labyrinth.

I have never believed that the affection, which I have denominated cochlitis, involved the cochlea solely, but that it affected that part of the ear predominantly, just as a patient may have severe hyperæmia, and even inflammation of the external auditory canal, quite secondary to the main trouble in the middle ear.

It would be very convenient indeed, if we could separate diseased parts from each other by a line as distinct as that in facial erysipelas, or, to use a geographical comparison, as marked as the separation of Mexico from the United States by the Rio Grande; but the present writer inclines to the view that to give the exact line of demarcation in disease, is very often impossible.

In the third of Dr. Sexton's cases, the patient was absolutely deaf to all external vocal sounds, but she hears her own voice in talking. Yet, sometimes, even that becomes inaudible. "Today," quoting Dr. Sexton's words, "she could not hear herself scream." "She hears some letters of the alphabet better than others." When dismissed from treatment, "she hears her own voice in the natural tone." "She hears herself sing, but cannot hear herself whistle." "A vibrating tuning-fork is heard when placed on the teeth and mastoid, but is *not* heard when placed on the vertex." She is absolutely deaf as to the voice of others." Here again the tuning-fork is not fully heard. I can only repeat with reference to this case what I have said with reference to the first, that so far as the power of hearing the tuning-fork and the voice shows anything, it indicates, unmistakably in my opinion, disease of the auditory nerve in some part of its course.

In the fourth case, the patient "hears his own voice distinctly, but the distinctness varies, frequently, for a few moments at a time. He hears absolutely no voice in the left ear, but in the right he hears sound when a metallic bougie is struck on the tuning-fork near his ear." A little while before dismissal it was noted that he could "hear all the notes on a piano up to middle C, but above that letter he can only distinguish a rumbling sound." This fact, it seems to me, indicates that the portion of the labyrinth tuned to high notes was more affected than that tuned to lower notes. When he was dismissed from treatment he could not hear any conversation, even through a trumpet. "Very low tones uttered close to his ear were painful." This symptom of pain from *sound* was long since stated by myself to be, perhaps, an evidence taken with other symptoms, of disease of the labyrinth, and I believe it will be found that only those persons who give evidence of hyperæmia or inflammation of the labyrinth, either primary or secondary, are effected by sounds to any unpleasant degree.

The doctor then proceeds to remark that mobility of the drumhead, pathological changes in the ossicles, especially in the malleo-incudal and the stapeo-incudal joint, or fixation of the stapes in the oval window, are sufficient to account for all the phenomena of audition as described in the four cases which I have just cited. I have already expressed my own opinion, namely, that any or all of these changes are not sufficient to produce absolute deafness, to produce inability to hear certain tones at all, or to cause pain to be experienced when sound is conveyed to the ear. He then remarks, after having entitled his paper, "The Sudden Deafness of Syphilis," and having given four cases to illustrate it, two of which are not sudden at all, that the deafness in these cases is not always sudden ; that is to say, it does not always occur suddenly. He then refers for proof of his view, that the changes in the middle ear are sufficient to account for all the symptoms, to a paper published by him in the Transactions of the Otological Society for 1878.

It is to be expected that the majority of the readers of these *Archives* are familiar with this elaborate paper by Dr. Sexton, but since it has been alluded to in this argument, I am obliged to follow him there and to discuss the points which it contains.

As was stated in the beginning of this review, Dr. Sexton's article in *Hays' Journal* is apparently a sequel to the one published in the Transactions of the Otological Society. The latter is an argument in favor of the conducting as against the perceptive parts of the ear as being the seat of the phenomena of audition and disease, but it contains very few proofs for the correctness of the views advanced.

These are supposed to be found in the narration of the cases of the former paper. I am obliged to select merely those points that bear directly on the question under consideration.

Great stress is laid upon the fact that the membrana tympani is capable of transmitting from 16 to 40,000 vibrations a second to the auditory nerve, and upon the opinion of Edward Weber that the bones of the ear, and the petrous bone, are solid incompressible bodies, and that the fluid of the labyrinth is likewise incompressible, also that the ossicles must be regarded as solid levers which transmit waves of condensation and rarefaction to the fluid of the labyrinth moving it as a whole.

It is argued that because in health there is a very free motion or separation in the joint between the malleus and the incus, when disease has increased the separation, symptoms such as autophony and tinnitus may occur.

The separation of the joints is supposed to result from hyperæmia or inflammation of the drum or pathological changes in the ossicles. Then follows a discussion of double-hearing, so-called. Under autophony Dr. Sexton seems to include double-hearing; not hearing one's own voice naturally, hearing one's own voice as if at a distance down in a well or pit, all of which are referred to affections of the middle ear. It is stated that autophony does not occur when the membrana tympani is absent. It is stated that hearing the ticking of a watch and not hearing ordinary conversation, and the contrary, hearing better in a noise, are explainable by the condition of the malleo-incudal joint or drum-head or both, but no proof is given for this statement. I think I have shown that no adequate explanation has ever been given for the phenomenon of hearing better in the midst of noise.*

It is also stated that the effect produced by inhaling chloroform, ether, nitrite of amyl, or by taking large doses of quinine, is hyperæmia of the ear, and consequently temporary separation of the malleo-incudal joint. It is difficult for me to entertain such an explanation as this. That a man may take a dose of quinine, or inhale chloroform or ether or nitrite of amyl, and thereby separate his malleo-incudal joints by hyperæmia, and not at all affect the labyrinth is to me simply incredible.

But Dr. Sexton seems desirous to exclude the labyrinth from having anything whatever to do with hearing, except in a state of health. Even in disease artificially produced, the labyrinth he seems to believe, is isolated from all its surroundings, and enjoys an immunity that is not shown by any other part of the human body.

It is argued that tinnitus cannot probably have its origin in the incompressible cavity of the inner ear, but it is admitted that a sudden increase of blood in the labyrinth can force the stirrup from its close connection with the other ossicles, and that the return will be attended with sound, and in this way we may account, it is said, for the whistling and whirr of labyrinthine vertigo. In other words, the ossicles must still be held to account for an affection which, according to the writer's own statement, begins as a sudden increase of blood in the labyrinth. Thus having said in one breath, that tinnitus cannot have its origin in the labyrinth, in the next, it is stated that the sudden increase of blood in the labyrinth forces the stirrup outward and the return causes a noise ; *ergo*, the origin was not in the labyrinth.

But we are unable to follow Dr. Sexton through his arguments to prove what seems to be his belief, that almost all the symptoms that are seen in diseased ears, from sudden and absolute deafness to vertigo and tinnitus, are chiefly due to abnormity in the conducting mechanism and especially to " separation of the malleo-incudal joint." They are, as it seems to the present writer, of the kind already quoted.

It should be said, before passing on to a review of Dr. Sexton's conclusions, that one of the four cases, No. 4, which he has presented as proofs that the sudden deafness of syphilis is due to an affection of the middle ear, was published by Dr. Buck in his paper, he having seen the case in consultation, as one of disease of the labyrinth.*

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* Treatise on the Ear, p. 512.

In classifying these cases Dr. Buck says, "To the *second class*, finally, belong the following seven cases, in all of which it is fair to assume, from the comparatively normal condition of the middle ear and from the history of the case, that the labyrinth or its immediate vicinity was the seat of the pathological changes that caused the deafness." Although I would not attempt to argue from the weight of authority, for this difference of opinion cannot be settled by any reference to the names of those who advocate one view or the other, I cannot refrain from quoting Dr. Buck's words to show, that Dr. Sexton failed to convince the gentleman whom he called in consultation, that his theories were correct.

We now continue our review of the paper published in the *Journal of Medical Sciences*. Dr. Sexton states that the results already obtained do not warrant a favorable prognosis in the cases of sudden deafness arising from syphilis, and that the chances of success are not good, because the lesion is not ushered in with pain in the ear.

It seems to me, that a lesion which is ushered in by sudden and profound deafness, vertigo and great tinnitus is sufficiently alarming without pain, to invite an early consideration. We find no record in the cases given of the energetic mixed treatment advised, not as Dr. Sexton intimates, "by Wilde and later by Roosa," but advised first by Roosa and never by Wilde, so that we cannot say that the author would not modify his own prognosis, if he would resort to the treatment under which my own cases were benefited.

I will now present the conclusions reached by Dr. Sexton, and discuss them *seriatim*.

CONCLUSIONS. 1. "Syphilitic affections of the ear inducing sudden deafness are of exceptional occurrence."

I make no objection to this conclusion ; fortunately they are of exceptional occurrence.

2. "They would seem to be induced by a pre-existing hyperæmia in the ears, excited by sympathetic relationship, or by an inter-current attack of aural mucous catarrh." †

I confess I do not quite understand the point here : How a

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* *American Journal of Otology*, vol. i, no. 1.

† According to the ordinary lexicographers, *catarrh* is a discharge from, or an inflammation of, a mucous membrane. To use the term mucous catarrh is certainly not to increase the simplicity or correctness of aural nomenclature.

" pre-existing hyperæmia " is excited by a " sympathetic relationship," (a sympathetic relation between what?) I do not know. If this means that a person having syphilis, is more liable to a sudden deafness if he has previously suffered from a hyperæmia of the ear or from nasal catarrh, I think none of us will deny it, but as the conclusion stands I have failed to find it intelligible.

3. " The attacks are characterized by their sudden occurrence, and both ears are usually affected simultaneously, although the contrary sometimes takes place."

My experience has led me to believe that in a certain class of cases, those affecting the labyrinth, the attacks of deafness are sudden, but I have seen other cases of affection of the ear, which seemed to me to be caused or modified by syphilis, where the impairment of hearing came on gradually. As I have already said, in one of Dr. Sexton's four cases the deafness cannot be said to have come on suddenly, and in several of Dr. Buck's cases * the same is true.

4. " The deafness is always very great."

With regard to this I have only to say, that when the deafness is so great as to be nearly or quite absolute with regard to the human voice, I should conclude that there was a primary or secondary lesion of the perceptive apparatus, whatever may have happened to the conducting mechanism.

5. " This syphilitic affection speedily causes a disarrangement of the integrity of the chain of ossicles, most likely at the malleo-incudal joint, probably in some instances of the stapedo-incudal joint, or both of these. The movements of the stapes in the oval window are also likely to be interfered with. The two first mentioned conditions serve to explain the noises in the ears, and the autophony; the last mentioned condition would increase the anomalies of hearing."

This has been fully discussed in going over the subject. It seems to me not to have been proven, but to rest on assertions which even the author's selected cases do not at all substantiate.

6. " The disease is usually unattended by pain in the ears, it is non-purulent, and its incurability is a characteristic."

The affection causing the sudden deafness of syphilis is certainly usually painless. It is also non-purulent. But I cannot admit, if it

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* l. c.

be thoroughly treated, at an early period, that its incurability is a characteristic.

7. "The affection does not depend, so far as we know, on anomalies of any portion of the labyrinth, although the latter of course is liable to invasions from syphilis with the nature of which we are as yet unfamiliar."

So far as we know, the *sudden* deafness of syphilis, as shown by clinical and pathological investigations, does depend upon disease of the labyrinth. At least the evidence for the truth of this theory, is much stronger in my opinion, than for the one that it depends upon lesions of the middle ear, or especially upon an affection of the malleo-incudal joint.

If the reader will bear with me a short time longer, I will now tabulate the conclusions which I have reached regarding sudden deafness caused by syphilis and other affections, which I do not think have as yet been overthrown.

It is hardly necessary to say, that I am far from believing that these conclusions are absolutely correct and final. Undoubtedly, whatever may have been done as yet in that way, better knowledge will some day modify them.

1. Very great impairment of hearing, occurring suddenly, and not to be explained by the conditions found in the auditory canal or middle ear, so far as we can examine them, and not relieved at once, by mechanical treatment, whether occurring in the course of syphilis or not, probably depends upon a lesion in the labyrinth or auditory nerve.

2. Absolute or nearly absolute deafness, the inability to hear certain tones, are symptoms of either primary or secondary lesion of the labyrinth.

3. If the tuning-fork be heard very feebly or not at all when placed upon the skull, or if it is heard better through the air than when placed upon the bones, it is probable that there is disease of the labyrinth.

4. Syphilitic diseases of the labyrinth, if vigorously attacked by means ot mercury and the iodide of potassium soon after the beginning of the disease, may often be alleviated and sometimes cured.

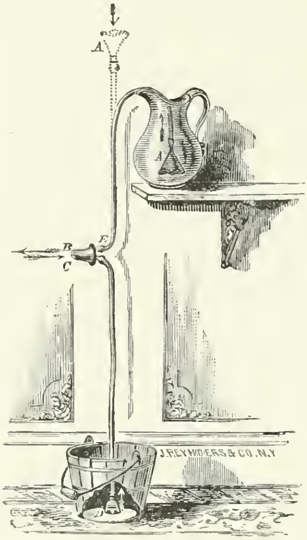
5. Pathological examinations of the labyrinth although not numerous, have already demonstrated that changes may occur there, which confirm the conclusions that have been formed from clinical investigation.

A NEW AURAL DOUCHE.

DURING the past summer Dr. Charles Fayette Taylor, of New York, suffered for a time from an acute suppuration of the middle ear, and found great relief from the use of warm water by means of the *fountain syringe.* His remarkably inventive mind soon turned his attention to the defects in this method of applying water to the ear for the relief of *pain*, and he invented the douche, of which a figure and description are here given. I cordially commend it to my professional brethren as a valuable means of applying warm water to the auditory canal, drum-head, and tympanic cavity. It is not useful as a *syringe*, but as a *douche.* I think it better in most cases than the fountain syringe. It may be obtained of Messrs. John Reynders & Co., 303 Fourth Avenue, New York.

The Fayette Aural Douche consists of two siphons, so arranged that the flow starts at the same moment in each; and while one siphon conveys the water into the ear the other lifts it gently out, without friction or pressure upon the inflamed tissues.

In the figure, *BC* represents the *ear-piece*, which is made of suitable size and shape. Two holes are bored through it, one lying above the other when it is in its proper position. On each of the two projections at the larger end, a piece of flexible rubber tubing (such as is used for nursing-bottles) about four feet long, is fitted. At the small end of the ear-piece the division between the holes is cut back about one-eighth of an inch, so that placing the finger over this end leaves one continuous passage from the top, *A*, to the bottom, *D*. With the finger over the small end of the ear-piece, as just described, when water is poured into the funnel *A* it will flow directly through both tubes, and come out at the lower end, D, in the drip-vessel. When all the air has thus been excluded and a current established, the funnel *A* is dropped into the basin or pitcher which serves as a reservoir, and a single siphon is formed. The rubber tubes are now compressed by the thumb and finger at *E*, so as to arrest the flow, the finger is removed from the end *BC*, and the ear-piece is inserted into the auditory canal: then letting go the tubes at *E*, a *double* siphon is instantly established, *AB* conveying the water into the ear, and *CD* carrying it out by atmospheric pressure. Thus the resistance and pressure, often painful, of the in-coming and out-going currents is avoided, and a small amount of constantly changing water, of any desired temperature, is kept in contact with the auditory canal and drumhead. Any amount of water desired can be used in one continuous bath, without the trouble of refilling the reservoir several times, as is so often required in using the fountain syringe. [D. B. ST. J. R.]



OBJECTIVE AURAL SOUNDS PRODUCED BY VOLUNTARY CONTRACTION OF THE TUBAL MUSCLES.

By SWAN M. BURNETT, M.D., of Washington, D.C.

MR A. P. L., 44 years of age, has possessed the power of producing a certain sound referable to the ears since his early childhood. He was not aware of such a power being unusual, until he called my attention to it accidentally some weeks ago, when under my care for some trouble in the right ear. The sound is produced by a voluntary muscular contraction in the throat. He says it appears to start from this region, and travel outward through the ears.

The sound, which is a fine mucous râle, and similar to the rubbing of the thumb and finger nails obliquely across each other, as suggested by Dr. Holmes in his paper in the last number of these ARCHIVES, can be heard in the *R.* ear at a distance of 50 *cm.*, and is clearest, I think, just on a line with the meatus. It is not heard on the left side at quite so great a distance. It can also be heard in front of the open mouth, also at about 50 *cm.* For the past few weeks he has been performing, under my direction, the experiment of Volsalva, and he finds that when he makes this muscular contraction in his throat at the time of forcible expiration, the air enters the drum cavity with much greater readiness. In fact, he has become able to force a small stream of air into the middle ear of the right side, by simply closing his mouth and making an expiratory effort at the same time that he produces the contraction in his throat. On the other hand, when the middle ear is filled with air, by making the contraction, it passes out into the throat. The contraction takes place on both sides simultaneously as a rule, though, occasionally, it appears on one side a little in advance of the other. He has not the power to produce it on each side separately.

I watched the M.T.T. during the movement, and could not notice that the position of the malleus was in the least altered. I therefore infer that the tensor tympani does not participate in the contraction.

My friend, Dr. F. Hyatt, an expert laryngoscopist, was kind enough to examine for me the pharynx during these contractive movements. I also myself saw the movements in the larygoscopic mirror with great distinctness.

During the contraction the anterior wall of the pharyngeal orifice of the tube remains perfectly stationary, while the posterior lip is moved obliquely forward and upward across the mouth of the tube, the edge sometimes reaching to the anterior border, completely closing it, but usually going only about two-thirds of the distance across. The uvula is, at the same time, drawn upward. In a large number of observations, carried through several days, these movements never varied in their character. The mouth of the tube was in a perfectly normal condition. It may also be stated that this gentleman possesses the power of contracting his aural muscles, particularly the retrahens aurem.

This case is instructive, in the first place, in that it shows that the objective aural sounds are not produced by a contraction of the tensor tympani, as was supposed by Dr. Holmes. The movement of the M. T. observed in his case, can be accounted for, I think, by the thinness of the membrane which allowed it to be easily affected by the alteration in density of the air in the drum cavity which is the natural result of the suction movement produced by the contraction.

I think the sound is caused by a separation of the moist surfaces of the mouth of the tube after they have been brought together by the contraction of the levator palati. This sound is carried by the substance of the tube, or the air contained in it, to the terminal expansion of the auditory nerve by way of the drum, and is thence projected outward.* The great value of the observation, however, lies in the light which it throws on the action of the muscles of the Eustachian tube.

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* During the act of swallowing, if one will observe, a sort of crackling noise will be heard in the ears. This is, in my opinion, produced by the same cause as the sounds heard in this case, namely, by the separation of the lips of the mouth of the tube.

It has always been supposed that the action of the levator palati was to draw the floor of the tube upward, the mouth being thus shortened and widened. The tensor palati, acting at the same time, was thought to separate the walls of the tube and thus open the way from the pharynx to the cavity of the drum.

Our observation seems to negative this view altogether. During the contraction of the levator palati there is no shortening and widening of the tubal aperture, but on the contrary a closure more or less complete of the pharyngeal orifice, and even after the relaxation of the muscle there is no observable opening of the tube due to the contraction of the tensor palati. These observations are very similar to those made by Lucæ and reported by him in recent numbers of Virchow's Archives, on some persons in whom the nasal cartilages had been destroyed by lupus, leaving the pharyngeal orifices of the tubes exposed to view during deglutition and phonation. He thinks that if the tube is opened at all it is by an internal dilatation simultaneous with closure of the external orifice, due to simple mechanical inflation or action of the tensor palati.

In our case we have, in all probability, the same action of the tubal muscles as in the act of deglutition, since the contraction very much facilitates the entrance and exit of air from the cavity of the tympanum.

Therefore, while it is now demonstrated that the mouth of the Eustachian tube is not opened, but closed by the action of the levator palati, the question of how it *is* opened, if *at all*, is not clearly shown. It is evident, however, that the permeability of the tube is increased, and the most plausible explanation is that of Lucæ given above. The emptying of the tympanum of air by swallowing I would consider satisfactorily explained on the principle of suction, the separation of the lips of the tube being affected in such a manner as to draw the air from the drum cavity down into the throat.

September 25, 1879.

REPORT ON THE PROCEEDINGS OF THE BRITISH MEDICAL ASSOCIATION,

HELD AT CORK, AUGUST, 1879.

(Being an abstract of the Report published in the *British Medical Journal,* August, 30, 1879.)

By Dr. F. P. CAPRON, of Yonkers, N. Y.

Wednesday, August 6th.

THE conference was opened by Dr. Cassells (Glasgow), who, after a few remarks concerning the fact that to-day, for the first time, otology has received a distinct recognition in the proceedings of any medical congress in this country, proposed that Dr. Laurence Turnbull, of Philadelphia, be requested to preside over the meeting. The proposition was seconded and unanimously carried. Dr. Turnbull then took the chair, and, after a few complimentary remarks, introduced the business of the day.

On the Production of Artificial Deafness, being an Experiment in Physiological Acoustics, and its bearing on the Etiology and Evolution of Diseases of the Ear. By J. Patterson Cassells, M.D. (Glasgow). The experiments of Valsalva and Massiat were employed to show that a disturbance in the tympanic tension causes not only defect of function but also tissue-changes. These experiments seemed to bear out the following theory of the etiology and evolution of ear-diseases. 1. A certain degree of tympanic tension is essential to perfect function, that is, perfect hearing. 2. The essential cause of all the affections of the organ of hearing is a disturbance of the normal tympanic tension. 3. All the pathological phenomena of the diseases of the ear evolve themselves with regular frequency.

Throat-deafness associated with Paresis of the Palato-tubal Muscles. By E. Woakes, M.D. (London). This paper treated of a form of deafness due to a loss of power—paresis—of the intrinsic muscles of the ear, the clue to which is furnished in a co-existent paresis of the muscles of the Eustachian tube and palate. The latter condition, which is readily observed, affords the clue to the existence of the former; the correctness of the diagnosis being established by the identity of the sources of the nerve-supply of the muscles proper to the ear, and of those of the tube and palate. The symptoms whereby this form of deafness may be diagnosticated from other ear affections were detailed, and the paper concluded with an illustrative case, in which the proper remedial measures were given.

Dr. Weber-Liel (Berlin) agreed with Dr. Woake's observations.

Mr. Lennox Browne (London) considered the catarrhal element very important in the cases mentioned, and expressed a preference for Politzer's inflation over that of the pneumatic tractor.

Dr. McKeown (Belfast) referred to the comparatively few cases in which the nervous element was present.

Dr. Woakes, in reply, remarked that Politzer's inflation was used with the catheter, and that the power of the tractor could be regulated. He did not maintain that all cases of tubal deafness were due to paresis, but that there were some, the result of vaso-motor influences.

The Therapeutic Value of Intratympanic Injections of medicated Fluids in the Catarrhal Affections of the Middle Ear.

A discussion on this subject was opened by Dr. J. Patterson Cassells (Glasgow). In his earlier practice as a specialist he had for many years employed the injection of medicated solutions in the treatment of the diseased tissues of the middle ear, but of late years, having become satisfied of the inutility of such solutions aside from the air contained in them, or injected along with them, he had abandoned their use. He thought it impossible to break up adhesions, dissolve mucus, and restore the mobility of the tissues of the ear by medicated solutions of zinc, copper, chloral, etc., while these tissues themselves, and the mucus contained in the tympanum, outside of the body, were found wholly insoluble in such solutions as liquor potassæ, absolute alcohol, etc. Dr. Cassells considered that the discussion ought to be one of chronic non-suppurative catarrhal affections of the middle ear; and that the value of the act of inflation should be considered apart from the action of the medicated fluid. He asked that those giving their opinions should see that such were supported by facts in their own experience.

Intratympanic Injections. By Dr. WEBER-LIEL (Berlin). The author had come to the conclusion that it is imposible to cure inveterate catarrh of the tympanic cavity by means of the intratympanic injection of medicated fluids. The symptoms of catarrh of the tympanum may depend upon, (*a*) Extension of a simple catarrh from the Eustachian tube and pharyngo-nasal cavity; (*b*) not only upon a catarrh of the tube, but also upon a collapse of the walls of the Eustachian canal, due to insufficient or paralyzed action of the muscles of the Eustachian tube; (*c*) upon alterations of the vaso-motor and trophic nerves, and of the sympathetic supplying the tympanic cavity. In each of the three cases mentioned the cause or causes demand treatment. Thus, for the first, injections of strong solutions of nitrate of silver into the mouth of the Eustachian tube, followed four days later by the use of the air-douche. A few drops only of the solution are to be used, and the patient must not blow his nose till four hours after the injection.

In the second set of cases electricity, intratubal, is recommended. For the third class, carbonate of soda may be used to soften false bands of tissue and intratympanic adhesions, also to diminish mucus and incrusted matter. In this last class intratympanic injections had been found to give good results. The injections, combined with air-pressure, were effected by means of his pharmaco-koniantron.

The Treatment of Non-Suppurative Hypertrophic Catarrh of the Middle Ear. By LENNOX BROWNE, F.R.C.Ed. (London). Mr. Browne maintained that the use of intratympanic injections is much less extensive than formerly, and showed objections to the practice on anatomical, physiological, and practical grounds.

From an anatomical standpoint he claimed that the practice is injurious since, to send the fluid as drops or spray, it is necessary to pass the instrument into the tympanum. But great force may accomplish the same, yet each is attended with great danger. Also, from the anatomical relations of the tympanum, cerebral inflammation, jugular phlebitis, etc., may arise, if acute catarrh be produced. On physiological grounds he objected because the tympanum is an air-cavity, and will not endure the presence of a fluid. In his own practice Mr. Browne claimed no beneficial results, but, on the contrary, had often seen alarming inflammation thus produced. If to be employed at all, he would limit the use of injections to suppurative cases with a perforate membrane, or, at the time of making the injection, he would perforate the membrane. The speaker concluded by stating that he doubted if such cases are ever cured, but thought that their condition might be greatly improved by means of inhalations, Valsalvan, Politzer, and cathetric inflations, with pure air or medicated vapors, by use of the post-nasal douche, by faradisation, by means of the exhausting speculum, and, lastly, by careful attention to the constitutional diathesis.

Dr. Cassells disapproved of the treatment because he did not get good results. He had injected salt through perforate membranes, and was successful in removing the mucus.

Dr. Kirk Duncanson (Edinburgh) asked how Dr. Cassells removed all the fluid. In his practice he had noticed that only a small portion of the fluid injected by the Eustachian tube came out through the perforated membrane.

Dr. Cassells replied that he thought a large portion of the fluid went down the throat.

Dr. Duncanson thought some of the fluid remained in the tympanum, its floor being below that of the meatus.

Dr. Pierce (Manchester) thought medicated injections no improvement over medicated air.

On the Treatment of Relaxed Membrana Tympani. By W. A. McKeown, M.D. (Belfast). Dr. McKeown stated that almost all the evils resulting from affections of the tympanum arise from a drawing or pushing in of the membrana tympani. The primary consideration of the treatment should be to prevent this, which can be done by means of some agent which, when applied to the membrane, will diminish its concavity, pull it out, and increase its resistance. During recent experiments he had been led to think of collodion as a proper agent, which, accordingly, he first tried June 1st, in the case of a middle-aged lady, whose drum-heads were relaxed. A temporary improvement followed. Believing that he had used too little collodion, on June 2d he employed it more freely upon another case which he had treated for three years, lately by means only of tonics. The patient was a woman 40 years of age. She could hear a moderate voice at three feet, hearing varying. The patient suffered severely from noises of various kinds. The membrane of the left ear showed a number of depressions between the handle of malleus and posterior attachment of the membrane. She could inflate the drum, the depression bulging out, afterward collapsing at once. Collodion was applied freely, the membrane became tense, hearing for voice improved to eighteen feet, and the noises disappeared. Collodion remained adherent till July 28th, and was then but partially loose. On removal of the collodion the membrane was found greatly improved, the depressions had disappeared, but membrane still too lax. Removal of collodion caused little, if any, change, yet it was thought best again to apply it. Dr. McKeown claimed for collodion power to effect the following objects: 1. To rupture adhesions. 2. To rupture even the membrane itself. 3. To restore mobility to a rigid malleus. 4. To keep open an artificial perforation by means of traction. 5. To prevent adhesions in case of recent catarrh. 6. To relieve noises in the ears. 7. To prevent adhesion of the membrana tympani, and retraction of the tensor tympani, also to prevent and relieve labyrinthine pressure. A table of eleven cases was submitted, in which Dr. McKeown had applied collodion to the membrana tympani with satisfactory results.

Dr. Pierce (Manchester) thought much might be done by collodion, but that it should be applied with care. He asked if collodion had a permanent effect in cases of collapse of the membrane.

Dr. Macnaughton Jones (Cork) asked if the collodion were applied in a particular way in different cases, and where.

Dr. McKeown said no danger arose from collodion on the walls of the meatus, as it will not stick. It is used to cover a considerable surface, and has been known to remain adherent for three months.

Thursday, August 7th.

Dr. FITZGERALD, of Dublin, took the chair.

The Audiometer as an Exact Test of Hearing. By LENNOX BROWNE, (London).

Mr. Browne exhibited the audiometer of Professor Hughes, and demonstrated its use. He regarded it as an accurate, uniform, and exquisitely fine method of testing, registering, and comparing the hearing. He remarked that the patient should not be allowed to see the movements of the instrument. The first advantage of the instrument he considers to be that the zero point is absolute and not personal, since it depends upon a fixed law of electrical induction. Mr. Browne suggested that a certain standard should be adopted, and each instrument marked by some competent authority, the Society of Arts, for instance, to secure uniformity. The audiometer was stated to be useful not only as a test of hearing in deaf persons, but also as promising to afford a standard of hearing power. It was suggested as of possible service in testing the fineness of auditory perception in those about to be educated for the musical profession. The audiometer represents exactly the amount of sound it is necessary to pour out for the sonorous vibrations to be appreciated by the recipient. Each degree on the audiometric scale represents an exact amount of electrical power which electricians can reduce to an absolute measure correlative with other forces. Attention was drawn to the possibility of the audiometer being of service for improving the auditory perception of deaf patients.

Dr. Pierce (Manchester) thought it better to use the scraping noise only, and not the tapping, in working the instrument, and preferred a single movement of the key to rejecting it frequently. He considered no comparison to exist between the watch and the audiometer, and that both should be employed.

Dr. Duncanson preferred a telephone.

Dr. McKeown considered the phonograph as the instrument giving the best sounds for testing hearing.

Dr. Weber-Liel said different effects were found from different kinds of noises in the use of the telephone.

Dr. Jacob (Dublin) thought the audiometer was of much value, but that something more was to be done, *i.e.*, to establish a unit of sound.

Dr. Cassells remarked that something to utilise the human voice as a test of hearing is what we most need.

Dr. Beard, (New York) prefered the stop watch.

Dr. Fitzgerald preferred the voice.

Perforation of the Membrana Tympani. By Dr. BONNAFONT (Paris).

Dr. Bonnafont had perforated the drum-head by means of charcoal points, by various caustics, and twice with the actual cautery, using a stick of charcoal and dragon's blood. The result was always satisfactory, hearing being present as long as the opening existed. He had thus far been unsuccessful in maintaining an opening beyond a short time.

Cases of Aural Exostosis. By F. M. PIERCE, M.D. (Manchester). The author had met with only nine cases of exostosis in three thousand cases of ear-disease. Six new cases of acquired exostosis, and all the nine occurred in males. Five had exostosis in both ears, and had not had rheumatism or gout. Two cases presented a history of syphilis ; three had otorrhœa, but only in one case of the middle ear ; in two cases polypi existed with the exostosis. In none of the cases were the exostoses limited to the upper wall of the meatus, nor were there indications of a similar condition in the middle or external ear. The exostoses were almost wholly non-pedunculated ; the etiology included chronic periostitis, chronic otorrhœa, gout, rheumatism, and syphilis. The only successful treatment is to remove the exostosis, if threatening complete occlusion, by strong nitrate of silver, followed by chloro-acetic and nitric acids. If these do not prove successful, the galvano cautery ; in case of entire closure, the dental engine.

On the Etiology of Aural Exostoses, and on their Removal by a New Operation. By J. PATTERSON CASSELLS, M.D. (Glasgow). Dr. Cassells called attention to the difference between exostosis and hyperostosis, the former being a new growth, the latter a hyperplasia of the osseous tissue of the meatus. He explained the origin and development of an aural exostosis as follows : A subperiosteal abscess formed over the mastoid makes its way out where the least resistance is offered, and discharges ; from and around the opening vascular granulations spring up, and increase in size, becoming changed into bony tissue. The new method of treatment consists in passing a loop of wire over the tumor, and, grasping the pedicle firm, a sharp gouge is carried down to the base of the tumor, and two or three blows upon this with a mallet effect the separation of the mass, which it is drawn out by the wire.

Friday, August 8th.

Dr J. PATTERSON CASSELLS in the chair.

A Contribution to the Knowledge of Fungous Ear-Diseases. By Dr. LÖWENBERG (Paris). Dr. Löwenberg mentioned a peculiar form of fungus of the external meatus, consisting of a small, closed, oblong, and rather flat bag or cyst. He attributed the cause of fungi, in many cases, to the astringent and other solutions applied to the ear. To prevent fungi he would filter and boil all instillations previous to their use, and would treat fungi by the free application of diluted alcohol, gradually increasing the strength.

Dr. Laurence Turnbull (Philadelphia) thought fungi might be due also to the use of a dirty syringe.

Mr. Lennox Browne (London) agreed with Dr. Turnbull, and recommended glass syringes and the use of antiseptic solutions.

Dr. Fitzgerald (Dublin) mentioned a case in which the disease was traced to the patient having spent much time in a conservatory where there were many geraniums.

Dr. Cassells (Glasgow) attributed fungi to dirt propagated from decaying matter, and to dampness. The constitutional conditions as well as local to be treated.

Tinnitus Aurium. LAURENCE TURNBULL, M.D. (Philadelphia), opened a discussion on this subject. Dr. Turnbull considered tinnitus aurium to be invariably due to an excitation of the terminal filaments of the auditory nerve. He presented a table of three hundred and seventeen cases of ear-disease, in one hundred and sixty-six of which tinnitus was present. In sixty-six the sounds were likened by the patients to "hissing like a steam engine," "buzzing," "whizzing," "pounding," etc. In twenty-two the noise resembled the "ringing of bells," "tapping of a drum," etc. Twenty-three had roaring sounds; seventeen had continuous noises, such as "humming like a fly or bee." Four only presented sounds of a pulsating character. The local disorders accompanying these cases were thickening of the membrana tympani, and alteration of the position of the handle of the malleus from retraction of the membrane in otitis media catarrhalis, subacute or chonic: of such sixty cases. In forty-five otitis externa was the cause. In seventeen cases were present the results of chronic catarrh of the middle ear, together with acute or chronic inflammation of the membrana tympani and ankylosis of the articular surfaces, also thickening and hypertrophy of the mucous lining of the middle ear. Lastly; ten throbbing and four pulsating, with hyperacusis and dizziness. Dr. Turnbull mentioned ten cases in which a peculiar whistling and puffing sound, due to aneurism of the branches of the internal carotid and the temporal branch, was present; also, two others in which disease of the heart was accompanied by a tinnitus of a "jumping" or "roaring" character. He thought tinnitus was rarely of a nervous origin, but generally due to pathological conditions outside the brain proper. According to the etiological classification of Greene & Fisher, of Boston, endorsed by Jurasz, Epstein, and Hemming, we have the following: 1. Physiological murmurs in the internal carotid dependent upon partial stenosis of the carotid canal. 2. Pathological murmurs in the internal carotid, probably due to reduced vascular tension. 3. Pathological murmurs from aneurism of vessels of the head. Tinnitus is rare as a symptom of cerebral disease. Dr. Turnbull spoke of the importance of treating the upper air-passages on account of the swollen and hypertrophied mucous membrane covering the turbinated bones, which prevents air from entering the Eustachian tubes.

The Forms, Causes, and Treatment of Tinnitus Aurium. By W. DOUGLAS HEMMING, M.R.C.S.E. (Bournemouth). Mr. Hemming gave, in a tabulated arrangement, the various forms of tinnitus with their respective causes. 1. Tidal to-and-fro noises, due to tobacco and chronic middle ear catarrh. 2. Humming or buzzing noises, caused by impacted cerumen, eczema, foreign bodies or parasites in the external meatus. 3. Gurgling or bubbling noises, due to fluids in the tympanum or Eustachian tubes. 4. Rustling or crackling noises, due to deficiency of cerumen, hairs on the membrane or in the meatus, and acute catarrh in its later stages. 5. Constant rushing noises caused by venous congestion of the labyrinth. Extra-aural causes are aneurism of a neighboring vessel or of the aorta, anæmia, overwork of the brain, gout, obstructed portal circulation, mechanical causes, infantile diseases, cerebral diseases, etc. Intra-aural causes are: 1. In external ear,—inflammation, dried pus on the membrane, aspergillus, etc. 2. In the middle ear,—adhesive mucus on the membrane, in the tympanum or Eustachian tube, acute or chronic catarrh, etc. 3. In internal ear,—labyrinthine congestion, arterial or venous. Treatment,—Extra-aural cases require constitutional measures; intra-aural, for inflammation of external meatus, the usual measures recommended. In the condition of the middle ear causing tinnitus, the posterior nasal douche advised, and, also, vapor inhalation of benzoin, creosote, etc., forced in by Politzer's or Valsalva's method. In acute tympanic catarrh, the aural douche, leeches, paracentesis of drum-head, etc. To overcome contraction of intrinsic muscles Mr. Hemming advised drawing out of the membrane by Siegle's speculum ; to restore muscular tone, electricity ; as a last resort division of tensor tympani. For labyrinthine congestion hydrobromic acid was recommended.

Dr. Turnbull (Philadelphia) had found electricity of little use. Had employed injections of hydrobromic ether with good results.

Mr. Hemming replied that he thought he had obtained good results from electricity.

Dr. Edis spoke of lactation as a cause of tinnitus.

Dr. Pierce thought there were vascular and nervous causes of tinnitus. He favored the use of hydrobromic acid, but not electricity.

Mr. Lennox Browne objected to putting water into the ear in applying electricity. Had found hydrobromic acid of much benefit.

Dr. Woakes thought hydrobromic acid of use when there was a want of vaso-motor control of the vertebral artery.

The following papers were taken as read :

On the Occurrence of Exostosis within the External Auditory Meatus in the Pre-historic Man. By CLARENCE J. BLAKE, M.D. (Boston).

Ear Diseases and Life-Assurance. By J. PATTERSON CASSELLS, M.D.

Note on Tinnitus Aurium. By S. SEXTON, M.D. (New York).

1. *Inflation of the Middle Ear in cases of Cleft Palate, both before and after Staphyloraphy.*

2. *Chloroform-Vapors in Inflation of the Middle Ear.* By C. S. TURNBULL, M.D. (Philadelphia).

AN ABSTRACT OF AMERICAN OTOLOGICAL LITERATURE FOR THE THIRD QUARTER OF 1879.

By SWAN M. BURNETT, of Washington.

1. *Objective snapping noises in the ear, by W. R. Amick, Cincinnatti Med. News, September.*

The patient was a young woman of 30, troubled with pain in the cardiac region. When 18 years old, after some "fainting spells," she first noted the snapping noises. They are loudest when she is excited, and can then be heard at a distance of four feet. A very slight movement of MT. can be observed when the sounds are loudest. It is not very certain whether the tone of the tuning-fork is altered by them. There are about 54 "sounds" per minute, the pulse being 80, but there is no regularity about their occurrence. The cavity of the drum is considered healthy, and hearing is normal. A. thinks the tensor tympani passive, and that the sounds are created by the action of the tubal muscles. These muscles, he thinks, in accordance with the at present generally accepted theory, open the mouth of the tube during contraction. No mention is made of an examination of the mouth of the tube during the sounds.

2. *Chronic suppurative inflammation of the middle ear, by O. D. Pomeroy, N. Y. Medical Record, July 26 and August 2.*

In these lectures Dr. P. considers the subject of chronic suppurative inflammation in all its details, from etiology to treatment. The principal point in etiology, which we shall notice, is that he considers the employment of the nasal douche, however carefully used, quite a frequent cause of the trouble. As regards treatment, he places, of course, particular stress on cleanliness ; and this he accomplishes not as much by syringing as by the use of absorbent cotton. The astringent most in favor with him is the nitrate of silver in solution from 10 grs. to ℥j up to saturation according to indications. If the opening in the MT. is small, he does not hesitate to enlarge it so that the astringent can enter into the tympanum freely. He removes polypi first, by means of forceps (preferably Hinton's), and then applies argt. nit. sol. In case the argt. nit. fails, he uses acid nit. or acid nit. of mercury.

Aural therapeutics, by L. Turnbull, Medical and Surgical Report. August 2.

Dr. L. claims that as regards the therapeusis of ear troubles, as good results can be shown as in the same character of practice in other departments. He then proceeds to consider the action and application of various drugs in the treatment of aural diseases. Aconite he has found of very essential service in acute catarrh, attended with pharyngitis and fever, in doses of from 1 to 5 drops of the tinct. of the root. Digitalis he uses in delirium, tinnitus aurium, etc.; strychnia in atrophy of the auditory nerve. The bromides he employs in sleeplessness, nervousness, etc., associated with subjective sounds.

The sudden deafness of syphilis, with cases by, S. Sexton, American Journal of Medical Sciences, July.

The *conclusions* at which S. arrives are:

1. "Syphilitic affections of the ear, inducing sudden deafness, are of exceptional occurrence, and—

2. "They would seem to be induced by pre-existing hyperæmia in the ear, excited by sympathetic relationship, or by an intercurrent attack of aural mucous catarrh.

3. "The attacks are characterized by their sudden occurrence, and both ears are usually affected simultaneously, although the contrary sometimes takes place.

4. "The deafness is always very great.

5. "This syphilitic affection speedily causes a disarrangement of the integrity of the chain of ossicles most likely at the malleo-incudal joint, probably in some instances at the stapedo-incudal joint, or both of these. The movements of the stapes in the oval window are also likely to be interfered with. The two first mentioned conditions serve to explain the noises in the ears, and the autophony; the last-mentioned condition would increase the anomalies of hearing.

6. "The affection does not depend, so far as we know, on anomalies of any portion of the labyrinth, although the latter, of

course, is liable to invasions from syphilis, with the nature of which we are yet unfamiliar.

7. " The disease is usually unattended by pain in the ears ; it is non-purulent, and its incurability is characteristic."

We think there are aurists who would decidedly dissent from Dr. S's views as regards the seat of the lesion in the cases given. All the symptoms are such as we are accustomed to refer to labyrinthine troubles, and while undoubtedly there were grave alterations found in the conducting apparatus, the question is pertinent as to whether they are in and of themselves sufficient to account for the character and severity of the symptoms present. Even in cases of middle ear trouble from ordinary causes, where such severe symptoms and such profound deafness are present, we can very justly suppose a labyrinthine complication, but such a supposition is rendered still more justifiable when we have syphilis as a cause, from whose invasions no locality or tissue seems to be free.

On the use of permanganate of potassa in chronic otorrhœa, by Lucien Howe, Buffalo Medical and Surgical Journal, August.

H. has had a very good experience in the employment of this remedy, some of his cases having been treated without benefit by other astringents. He simply causes the patient to syringe the secretions out carefully, and then pour in a solution of the salt of the strength of from two to six or eight grs. to the ounce of water twice daily, or oftener if the discharge is profuse.

THE AUDIPHONE AND DENTAPHONE.

By CHAS. S. TURNBULL, M. D., of Philadelphia.

FOR many years various inventors have been engaged in devising some means whereby the deaf could be relieved from their infirmity, be enabled to hear spoken words and carry on conversation with those around them. One device has succeeded another, each only leaving the sufferer more disappointed than the last, until finally he has given up all hopes of relief, or, as in certain cases, is compelled to fall back on the clumsy, old-fashioned ear-trumpet. In a large number of instances, however, even the ear-trumpet could not be used, as the defect in the hearing was of such a nature that the sound vibrations, however intensified by an ear-trumpet or other device, could not be transmitted through the external or middle ear to the auditory nerve. Under these circumstances no advance seemed possible in the way of enabling the deaf to hear, and those who best understood the difficulties to be overcome could give no hopes of success.

The wonderful accuracy with which the phonograph and the telephone registered and reproduced the human voice, taken in connection with the fact that the nerves of hearing could be reached directly through the teeth and the cranial bones, led to the conclusion that if some instrument could be devised, sensitive enough to gather up the delicate sound vibrations that make up articulate speech, and convey them to the teeth, the problem of enabling the deaf to hear would be solved.

The instruments under consideration are the results of a long series of experiments based upon similar scientific facts, with which is coupled another acoustic principle, viz.: the superior power possessed by solid bodies of conducting or transmitting sonorous vibrations. To demonstrate this we would call attention to the tuning-fork, acoumeter, or watch, when placed on the teeth or cranial bones.

The first instrument to which our attention was directed was called the "audiphone," by its inventor, R. S. Rhodes, of Chicago, who, while searching for some means by which he might improve his hearing,* accidentally placed his watch between his teeth, and heard it ticking. After numerous experiments, based upon this observation, the inventor was completely successful in his own case, and the instrument with which he readily hears all ordinary sounds and conversations is the one he now offers to the afflicted public.

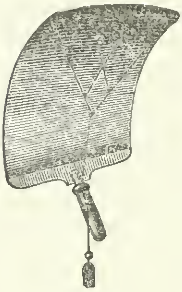

FIG. 1.

The instrument (Fig, 1) consists essentially of a diaphragm of hard rubber. This diaphragm is very thin and elastic, and is cut in the form of a square with rounded corners, so as to present a collecting surface about one square foot in size. For purposes of convenient adjustment, it is furnished with a neat hard-rubber handle, and might easily, says the inventor, be taken for a fan of Japanese pattern. When in use the upper and lower edges are made to approximate by a silken cord, so as to present a convex surface to the speaker and a concave one to the listener. The cord may be fastened at any convenient convexity of the surface of the auditory disk. When adjusted, the upper edge is pressed firmly against the anterior surface of the upper incisers, allowing the upper lip to rest upon the diaphragm, and the deaf person is then ready to listen. If the eye-teeth can be used, they generally give the best results. False teeth may also be used, especially if they fit tightly; should they not, however, they may be made to do so by pressing the lower teeth against them. If the natural teeth be too far gone to be used as directed, the roots may in many instances be utilized by having artificial teeth set into them. The handle of the audiphone should be held lightly, and the lower teeth should not touch the diaphragm, nor should it be held between the teeth or pressed too forcibly against the upper ones, thus curving the instrument already bent by the cord. It must be borne in mind that in all cases the vibrations of the upper edge of the disk impart to the upper teeth the sound-waves, which are transmitted through them to the cranial bones and auditory nerves.

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* Mr. R. lost his hearing through changes due to a chronic aural and post-nasal catarrh.

The audiphone, therefore, is entirely dependent upon the condition of the auditory nerves, because in direct proportion to the inherent power of these nerves—independent of the external and middle ears or acoustic apparatus—is the influence which this and all similar appliances will exert over the hearing power.

Before, however, we can arrive at any satisfactory conclusions concerning the actual practical value of the audiphone, we must define the words "deaf" and "deaf-mute" as ordinarily accepted, because upon a proper appreciation of the meaning of these common and vague terms, hinge the merits of the instrument for which miracles are inadvertantly claimed by its inventor, and ignorantly ascribed to it by the public.

To the medical man the word "deaf" is generally understood to express diminution of hearing power to any degree, unless the term be qualified by some word expressing the amount of deafness, be it partial, profound or absolute.

To the layman, the word "deaf" implies absolute deafness, while to him degrees of diminution of hearing power are best understood as "hardness of hearing," etc.

Again, to the medical man, the word "deaf-mute" is equally unsatisfactory, although it is usually understood to express absolute deafness since birth, hence muteism, unless the term be likewise qualified by some such prefix, as partial, semi or absolute, is too vague an expression.

To the layman, the word "deaf-mute" is understood to mean precisely what, when taken separately, the two words imply.

In this particular connection we have assumed that "the deaf," as a class, should be divided into—

a. Those who are *absolutely* deaf from *nervous* or *inner ear* deafness.

b. Those who are *profoundly* deaf from *acoustic* or *middle ear* deafness.

And likewise the "deaf-mutes" as a class into—

c. Those who are *absolute deaf-mutes.*

d. Those who are *semi-deaf-mutes* (and semi-mutes).

Absolute nervous deafness (*a*), which is comparatively rare, is in no way whatever benefitted by the application of the audiphone.

This deafness is caused *by direct implication of the auditory nerve*, through malignant, scarlet and typhoid fevers, cerebro-spinal and other forms of meningitis, tertiary syphilis, cerebral tumors, trauma, consanguinity, hereditation, old age, etc.

Profound acoustic deafness (*c*), which is likewise comparatively rare, is markedly, and in some cases signally, relieved by the use of the audiphone.

This deafness is caused through *direct implication of the middle ear* (or conducting apparatus) and its appendages, through the several forms of catarrhal and purulent inflammations, scarlet and typhoid fevers, secondary syphilis, trauma, consanguinity, hereditation, old age, etc.

Those who are *partially* deaf, from whatever cause, as a rule derive no benefit from the application of the audiphone; on the contrary, many such cases are annoyed by hyperacusis, etc.

Therefore the number of cases in which "the deaf are made to hear" with the audiphone is comparatively small, when we take into consideration the whole number of our deaf population. Audition will be improved by its use in but few of the many deaf persons who enlist the services of an aurist.

To use the audiphone with success the auditory nerves must be normally sensitive, the hearing power for loud voice, through middle ear deafness, must be reduced to a minimum, and the upper front teeth must be solid. The acoumeter, the tuning-fork, a thin sheet of vulcanite, of iron, of ash or poplar wood, and, best of all, a sheet of bristol-board or sized paper, will in every case enable us to decide whether the audiphone or its principle can be successfully applied.

Proficiency in its use requires practice, and those who for a long time have not heard ordinary conversation or their own voices, and who are accustomed, wholly or in part, to interpret sound by the movement of the lips of the person speaking, may not distinguish the words of the speaker when first using the audiphone, though the sound of these words be distinctly heard. The inventor being well aware, doubtless through experience, of the fact that when those with impared hearing know what to expect, they hear twice as well, offers the following as a method of practice that will enable many such to rely wholly upon sound : "Such persons should request a friend to read aloud, while they (the listeners) should carefully observe the words (as spoken) in a duplicate book or paper. When this is properly done, deaf persons will be surprised with what distinctness every word may be heard by the use of the audiphone, and they can in this way *educate* themselves."

Concerning *absolutely deaf-mutes* and the audiphone, we need say nothing further. They must be left to the patient teachers of the several methods of educating the true deaf-mutes.

To the *semi-deaf-mutes*, however, the audiphone will open a new world of enjoyment, and prove a useful instrument, especially in the hands of all instructors in our asylums for the deaf and dumb. In educating children according to Bell's method of visible speech, especially as very few even of those who are supposed to be born deaf are totally without some slight degree of hearing power, hence, nearly all of those educated in the asylums may be taught to speak, inasmuch as their dumbness is owing solely to their want of use of the organs of speech. Mutes, says the inventor, will learn to speak by holding the audiphone against the teeth, as already directed, and practice speaking while it is in this position. A good exercise for the mute, at first, to put one hand on the instructor's throat, watch the motion of his lips, while his other hand is on his own throat, the instructor meantime holding the audiphone to the mute's teeth. The mute will *feel* the influence of the sound in his hand on the instructor's throat, imitate it in his own throat, will *hear* the speaker's voice on the audiphone, and will be aided in imitating the speaker by *seeing* his lips, and will also *hear* his own phonation sounds as reflected from the audiphone, and the more readily therefore learn to articulate.

Music, its varying sounds and harmonies, as conveyed by means of the audiphone, awakens in the semi-deaf-mutes an unusually pleasurable sensation, as manifested by their gesticulations and facial expression.

Under the pretext of being a fan the instrument can seldom be used, and. being cumbersome and conspicuous, is open to the same objections as the ear-trumpet.

Since the advent of the audiphone, we have seen several markedly successsul cases of its application, but, as a rule, we think the instrument has been overestimated, and Mr. Joshua Foster, the able Superintendent of the "Pennsylvania Asylum for the Deaf and Dumb," we are sorry to say, was not favorably impressed with the audiphone, although we have heard through other sources of the satisfactory trial of the instrument.

The appliance is, however, in its infancy, and will no doubt be modified to meet many objections and requirements, but in so far as Mr. Rhodes has exerted his ability and ingenuity, we certainly think he is entitled to great praise, not only for his novel invention, but for its novel application.

The opera or concert audiphone is said to possess double power, but as the majority of those who can successfully wield the single disk instrument can use the latter for conversation or concert alike, we do not attach much importance to the double disk instrument. This latter consists of two disks, each about the size of the conversational, fitted into the same base, about a quarter of an inch apart, and separated at the upper edges the same distance, sufficiently to be evenly adjusted to different teeth, so that each disk may act independently of the other. The upper edge of each disk is set against *different teeth*, thus giving the vibration of a whole disk to each tooth, and thereby almost doubling the power. This form of audiphone is particularly well adapted for semi-mutes, not only because the sound received is of greater volume and more distinct, but also the voice of the semi-mute when spoken between the disks is very considerably intensified, and therefore the more distinctly heard by himself.

"THE DENTAPHONE"

is a novel instrument of the same practical application and acoustic principle as the audiphone, but constructed more after the plan of the telephone. It is made by the American Dentaphone Co., of Cincinnati, and is a more ingenious and well made appliance.

It is represented at Fig. 2, and consists, in brief, of a chambered box (similar to a telephonic mouth-piece) in which is secured an exceedingly delicate, easily vibrating, diaphragm. Connecting this with a wooden tooth-piece is a silken cord of variable length. The person using the dentaphone simply holds the instrument receiver in his hand in any convenient position, with the tooth-piece between the teeth, and the open side of the receiver facing toward the speaker. The silk conducting line connecting the receiver with the tooth-piece should be kept moderately tight, and may be shortened or lengthened to suit the convenience of the person using the instrument.

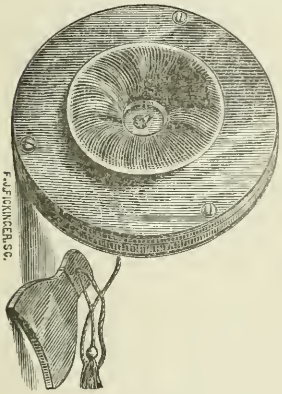
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FIG. 2.

The dentaphone weighs but one ounce and a half, and can easily be carried about the person. In testing the instrument, it compares most favorably with the audiphone, and answers fully as well for all requirements.

It is used for precisely the same class of cases as are improved by the audiphone, and bids fair to be a powerful rival.

Concerning an appropriate or descriptive name we would prefer the term "Dento-Audiphone," and recommend the substitution of fans (made of thin elastic wood, "bristol" or "binder's board") which are to be held between or against the teeth, and bent into a curve by pressure from the handle towards the teeth.

REPORT OF THE PROGRESS OF OTOLOGY IN THE SECOND HALF OF THE YEAR 1878.

I. REPORT ON NORMAL AND PATHOLOGICAL ANATOMY.

By Dr. H. STEINBRÜGGE.

Translated by JAMES A. SPALDING, M.D., Portland, Maine.

1. On exostosis within the ext. aud. meat. By PROF. TURNER. *Journal of Anatomy and Physiology*, normal and pathological, conducted by G. M. Humphrey, etc., vol. xiii, part ii, page 200.

2. Zur Anatomie des Warzenfortsatzes. [On the Anatomy of the Mastoid Process.] By Dr. E. ZUCKERHANDL. *Monatssch. für Ohrenhlkde*, 1879., No. 4.

3. Der Aquæductus cochleæ beim Menschen. By WEBER-LIEL. *Monatssch. für Ohrenhlkde.*, 1879, No. 3.

4. Ueber Sinusthrombose, Meningitis, Kleinhirnabscess nach Otitis media. [On thrombosis of the sinus, meningitis, and abscess of the cerebellum, after otitis media.] By Dr. E. F. KRETSCHY. *Wiener Med. Wochensch.*, 1879, Nos. 11 and 12.

5. Beiträge zur Pathologie und Patholischen Anatomie des Ohres. By Dr. ALBRECHT BURCHARDT-MERIAN. *Arch. für Ohrenhlkde.*, Bd. xiv, Heft iii.

6. Ein Fall von primärem Epithelial-Krebs des äusseren Gehörganges. [A case of primary epithelial cancer of the ext. aud. meat.) observed by Dr. DELSTANCHE, Jr., and Dr. STOCQUART (Brussels), and translated into German by Dr. Blau. *Arch. für Ohrenhlkde.*, Bd. xiv, Heft i.

7. Pathologisch-Anatomische Untersuchungen über Ozœna. [Pathological and anatomical investigations on ozœna.] By Dr. EUGEN FRÄNREL. *Virchow's Archiv*, Bd. lxxv.

8. Zur Pathogenese des Hirnabscesses. [On the Pathology of abscess of the brain.] By Dr. OTTO BINSWANGER. *Breslauer Aerztl. Zeitschr.*, No. 9, 1879.

In November, 1878, Turner (1) came into possession of an artificially deformed skull from a saltpetre mine in Peru. Both external aud. meat. were almost closed by exostosis. As it is a matter of doubt whether these new-formations can be due to the pressure to which such skulls are subjected from childhood, Turner examined the artificially malformed skulls in the Edinburgh Museum, and amongst seventeen he found but one, that of a Chenook Indian, with exostosis in both ext. aud. meat. In three others the ext. aud. meat. appeared, however, compressed in diameter from in front backwards, but Turner has seen these somewhat slit-shaped narrowings in many Peruvian skulls which had not been artificially compressed. Since the pressure exercises no further influence on the sphenoid bone and the surrounding portions of the ext. aud. meat., the author believes that he must deny its causal connection with the exostosis. Seligmann's and Welcker's papers on this same subject are also noticed.

Zuckerkanal (2) found in a body of a man whose organs of hearing offered no other abnormity, the mast. proc. without air-cells, but consisting of diploetic tissue filled on one side with fat. This discovery led to the examination of 250 ears, the manifold combinations of whose mastoid cells are communicated in detail in the original. While most authors have hitherto assumed that the air-cells in the mast. proc. occupy the greatest space in a majority of cases, with the diploetic tissue confined only to the summit of the apophysis and its medial walls, Zuckerkandl discovered that the air-containing and diploetic substances occurred alternately, even the whole process might be reduced to diploetic bone filled with fat. The cells were often so narrow that they appeared sclerosed. The cases also in which only air-cells were found, varied greatly in the size of the cells; those of the squamous portion predominating in size over those of the petrous portion. Larger cavities were also now and then found. In one case the whole process was seen to be occupied by a cavity, with ridge-like projections from its walls. The number of wholly pneumatic mast. processes was 39.8 per cent.; of wholly diploetic, 20 per cent.; while the mixed cases however made up the majority, 43.2 per cent. From this latter condition Zuckerkandl explains the frequent failure of injections in making preparations by corrosion, while Hyrtl ascribes this to the air contained in the cells.

The researches of Weber-Liel (3) confirm the statements of

Cotugno, who found, besides the real aquæductus cochlea, a venous canal running parallel with it, and ending in the scala tympani of the cochlea. The author accentuates the fact that the external opening of the passage is found within the posterior cranial fossa, and believes that it communicates with the subarachnoidal sinus, lying between the cerebellum and medulla oblongata. The entrance into the aquæduct, bounded above by a bow-shaped bony prominence, the janua arcuata Cotunni, leads first into a triangular furrow, the lower angle of which discharges into a fissure appointed for the glosso-pharyngeal nerve. Then the nerve, separated from the vagus by a lamella of dura mater, seems to enter the beginning of the aquæduct, but at once bends around, and leaves the cranial cavity, running along the furrow mentioned above. Another fold of the dura mater forms the upper boundary of the acquæduct, while the lower bridges over the sheath separating the 9th and 10th pairs, the bulbus jugularis, and so shut off the cranial cavity below. The author tints the canals in question by aspiration of a red or blue fluid, by drilling a hole into the super. semi-circular canal, gluing into it a glass tube, which he unites with a stomach pump. The canal can then be followed with a bone-shaver and file. A lining of dura mater passes into the aquæduct. Its length amounts to 11–13 *mm.* It runs in a slight curve, nearly level, and parallel with the vein, separated from the latter in the middle by a bony plate 1 *mm.* thick, to the cochlea, where both canals again approach to within ⅓ *mm.* and end close to the membrane of the fenest. rot. The aquæduct here widens again somewhat in the shape of a funnel. It does not contain any venous branch, but establishes a union of the perilymph with the arachnoidal spaces, while the vein just described opens into the sinus jugularis or petrosus inf. and lies in its course inward and in front of the aquæduct.

Kretschy (4) publishes three cases of fatal purulent inflammation of the middle ear, the cause of which will be described further on under section iv. In the first case, the left transverse sinus was found completly filled with an adherent plug, which in the middle was softened with pus. The sinus jugularis was filled with pus, and a defect in its anterior wall led to the rough, discolored petrous bone. The tympanum was filled with cholesteatomatous masses shining like mother-of-pearl. The fibrous tissue about the vena jugularis sinistra, was infiltrated with serum and pus from the lower jaw to the vena anonyma which contained a plug, which extended into the vena jugularis. The interior of the vein was thickened and ulcerated in spots.

In case 2, the autopsy showed at various spots an infiltration, partly serous and partly purulent of the inner membranes of the brain, as well on the convexity, as at the base of the cerebrum, at the edge of the left cerebellar hemisphere, as at the lower convolution. The left *M. T.* was destroyed, with but little pus in the tympanum. The author assumes that the sheath of the acusticus or facialis had transmitted the inflammation to the meninges.

Case 3, disclosed an abscess as large as a walnut in the left hemisphere of the cerebellum, and hydrocephalus internus. The connection with the ear-disease could not here be demonstrated.

Burckhardt (5) communicates four cases of chronic purulent inflammation of the middle ear. The first was that of a girl, æt. 19, who had suffered since childhood with left-sided otorrhœa, and who died with meningitic symptoms after an illness of sixteen days. At the autopsy the left trigeminus, acusticus and facialis were found embedded in pus, with circumscribed purulent infiltration of the pia mater at the base of the cerebrum, as well as at the surface of the cerebellum. A thrombus was also discovered at the left petrous bone, in the sinus petrosus superior. The bony channel of the latter, as well as the posterior wall of the pyramid, were perforated like a sieve, and these openings communicated with the antrum mast. The mucous membrane of the middle ear was thickened and the tympanum filled with polypoid granulations. A larger polypus passing out through the perforated *M. T.* filled the aud. meat. completely, and a smaller growth springing from the edge of the perforation closed the entrance of the tympanic tube. The antrum appeared unusually small, and the mastoid cells were wholly absent. The author draws attention to the unusual path by which the pus reached the brain. An operative interference was not undertaken, as meningitis was already present.

The other cases were of children of two and two and three-quarter years, and one of seven and one-half months, who died of tuberculosis of the meninges and organs of the chest and abdomen. The second case was marked by partial necrosis of the left wall of the sinus, while a plug filled the sinus itself and the bony walls of the sulcus transversus showed carious openings.

The girl seven and one-half months old (Case 3) had suffered from carious destruction of the left tympanum, bones of hearing and mast. proc., leading to a necrosis at the lower wall of the parietal bone. A girl of two and three-quarter years (Case 4, showed multiple caries on the skull, destruction of the left *M. T.*, hammer and anvil, as well as necrosis of a portion of the mast. proc., extending to the floor of the sulcus transversus, without leading to thrombosis of the sinus. The beginning of the disease of the ear dated, perhaps, from a fall upon the head.

The case of epithelial cancer published by the authors (6) was that of a woman, æt. 48, who, up to the age of 14, had suffered from right-sided otorrhœa. She came for treatment February 14, 1878. For a year she had noticed at the inner surface of the right tragus a small, hard nodule, which ulcerated and led to continually advancing destruction, accompanied with violent pains in the whole right half of the head. The bottom of the meatus seemed enlarged and filled with granulations, which hindered a more accurate view into the tympanum. A blind fistula, 1 *cm.* deep, without secretion, and perhaps originating from former caries, was found on the mast. proc. Violent subjective tinnitus, hearing for voice, as well as bone conduction for the tuning-fork, were still present on the right side. The treatment consisted in galvano-cautery, injections of a solution of chloride of lead, and morphia. By the end of March the disease had advanced toward the right orbit, the condyloid process of the lower jaw had yielded towards the left, the fibrous tissue of the neck was infiltrated, and the glands of the neck were swollen. In May the right facialis was paralyzed. In June the destructive process had attacked the skin behind the ear, the auricle was loosened, but only affected by the cancer at its closest connection with the meatus. Loss of sight in the right eye, impairment of the senses of smell and taste next ensued. Death followed in October, 1878.

At the autopsy, the brain was found normal in spite of extensive destruction of the temporal, sphenoid and frontal bones. The dura mater was intact, with exception of the envelope of the middle cranial fossa and a few spots at which it appeared thickened, and displayed a deposit of round, whitish bodies. A cancerous, cylindrical growth had penetrated the right external orbital wall. The nasal passages, posterior nasal cavity, pharynx and larynx, had been spared. Of the bones of the face, the right zygoma with the proc. zygomaticus, the ascending ramus of the lower jaw, and a portion of the upper jaw had been invaded by the morbid process. The *M. T.*, hammer and anvil were destroyed ; the plate of the stapes preserved. The sclerosed mast. proc. had resisted the destruction. The pharyngeal mouth of the tube was normal, and the tube permeable to air. The parotid gland, muscles, vessels and nerves of the whole neighborhood were, with a few exceptions, destroyed. The authors are of the opinion that the cancerous affection, at all events primary in the organ of hearing, had probably first developed itself on the tragus. The bones were gradually softened and destroyed, without formation of sequestra. The dura mater, as well as the bucco-pharyngeal fascia offered noticeable resistance to the advance of the neoplasm, owing to their fibrous structure.

E. Fränkel (7) communicates the results of four autopsies at the Hamburg Hospital, which offer a valuable contribution to our knowledge of the pathological alterations which may develop the symptoms of ozœna. Two of the subjects had died from phthisis, while the others exhibited syphilitic symptoms, besides the disease causing death. The first case (phthisis) showed hyperplastic inflammation in the sphenoid bone and Highmore's antrum, and on the other hand atrophic inflammation of the nasal mucous membrane, atrophy of the glands, fibrous transformation of the mucous membrane, secondary atrophy of the turbinated bones, but no ulcers except one near the tonsilla pharyngea. In the three other cases there was disease of the bone and the mucous membranes, more or less extensive loss of substance on the bones of the base of the skull, at the proc. pterygoideus, the partition wall of the nose and the side walls of the nasal cavity. In case 2 only (a syphilitic girl) had the ostitis resulted from ulcers of the mucous membrane, while in cases 3 and 4 (phthisis and syphilis) the bones appeared primarily affected, since the mucous membrane showed no ulcerations, nor ulcerative scars. In the first two cases, the three turbinated bones were atrophied, in the third case the lower only. In case 4 they were preserved. In cases 2 and 3 the mucous membrane of the throat was affected at the same time, since on the one hand was found atrophy of the glands and infiltration with small cells, on the other, gray discoloration of the mucous membrane caused by thickening of the epithelium. The remaining numerous combinations of the pathological alterations, as well as the microscopic conditions, cannot here be abbreviated, but must be studied in the original. The author concludes from these four cases, that the morbid causes imputed as the origin of ozœna, viz. : chronic rhinitis, caries, purulent inflammation of the neighboring cavities and syphilis, either by themselves or combined can cause the symptoms of ozœna, and that also a single exclusive cause does not exist, but on the contrary in most cases a discrasia is at the bottom. The epithelial alterations of the mucous membrane of the throat are not characteristic for ozœna, but appear idiopathically.

Binswanger's article (8) treats of the rarer cases of abscess of the brain originating after purulent inflammation of the middle ear, in which the abscess is not found near the morbid focus, but is surrounded by normal brain substance, and the morbid process has not been conducted along the well-known paths. Carious portions within the petrous bone, as well as purulent inflammation of the middle ear, can lead to the formation of abscess in the brain by metastasis without the roof of the tympanum, the dura mater or the petrous bone being on the whole coincidently implicated (Gull).

A case of this sort is next described.

A man, æt. 51, in whom neither discharge from the ear nor deafness had been observed, died after an illness of eight weeks with fever, loss of appetite and vomiting, with which were associated paralysis of the left arm, and just before death an epileptiform attack, clonic convulsions of the extremities, with extensive bedsores and dilatation of the right pupil. The autopsy revealed, besides abscesses in both lower lobes of the lungs, an encapsulated abscess of the brain, as large as a walnut, in the medullary layer of the right first frontal convolution. The brain, sinus and dura mater were normal ; the roof of the right tympanum somewhat red, but otherwise normal. The right tympanum was partly filled with spongy granulations, and a similar focus of granulations was found in the mast. proc. The *M. T.* was almost wholly destroyed, but the small bones were preserved. The author then discusses the way in which the inflammatory process was spread, and reaches the conclusion that the parasitic micro-organisms propagate themselves through the interfascicular spaces of the connective tissue surrounding the vessels, and thus cause metastatic abscesses in a distant portion of the brain. Perhaps more accurate researches within the brain in similar cases will discover detached and smaller foci of pus, indicating this path of propagation.

II. PHYSIOLOGY OF THE ORGAN OF HEARING.

By Dr. OSCAR WOLF, of Frankfort-on-the-Main.

1. Dr. Clarence J. Blake, Boston. The graphic and photographic illustration of sound-waves. *The American Journal of Otology*, vol. i, part 1, January, 1879, and part 2, April, 1879.

2. Dr. Clarence Blake. Die Vermendung des Trommelfelles als Phonautograph und Logograph, [The use of the membrana tympani as Phonotograph and Logograph.] *Arch. Ophth. and Otol.* vol. vii, p. 457. *Zeitschr. für Ohrenhlkde.*, Bd. viii, Heft 1.

3. Dr. Oscar Wolf, Frankfort. Versuche mit dem Edison'schen Phonographen. [Experiments with Edison's Phonograph.] *Zeitsch. für Ohrenhlkde.*, Bd. viii, Heft 1. *Arch. Otol.* vol. viii, p. 58.

4. Prof. E. Berthold, Königsberg. Analyse der im Nebengeräusche einer Stimmgabel enthaltenen Töne. [Analysis of the tones contained in the secondary noise of a tuning-fork.] *Zeitsbh. für Ohrenhlkde.*, Bd. viii, Heft 2. *Arch. Otol.* vol. viii, p. 250

5. A. D. Stewart, B.D. The ratio of the normal sensibility of the sound-conducting apparatus, to sound impressions of least intensity.] *Glasgow Med. Journal*, vol. xi, May, 1879.

6. Prof. W. Preyer, Jena. Akustische Untersuchungen. [Acoustic investigations.] *Samml. phys. Abhandl.*, von W. Preyer Zweite Reihe, 4. Heft. Jena, bei Gustav Fischer.

7. Dr. Adolph Klünder, Hemstedt. Ueber die Genauigkeit der Stimme. [On the accuracy of the voice.] *Arch. f. Anat. und Physiol.*, von Hiss, Braune und Du Bois Reymond. *Phys. Abtheil*, 1. und 2. Heft.

8. Prof. V. Hensen, Kiel. Ein einfaches Verfahren zur Beobachtung eines gesungenen Tones [a simple experiment for observing a tone when sung]. *The same Archives.*

9. Dr. Fr. Koláĉêk, Brünn. Ueber den Einfluss des den Schall leitenden Mediums auf in ihm schwingende Tonquellen [On the influence of the medium conducting the sound upon the sources of sound vibrating within it]. *Annalen der Physik und Chemie*, von G. Wiedemann. 1879, No. 5.

10. Benjamin W. Richardson, M. D. Some original researches with Prof. Hughes' new instrument for the measurement of hearing, the audiometer. *Medical Times and Gazette*, No. 1508, May 24, 1879. (*Preliminary communication*).

11. Zur Würdigung der Ohrenprobe. [On the value of the ear-test] Dr. A. Lesser. Eulenberg's *Vierteljahrs. für ger. Medi-*

cin., January, 1879, see review in No. 13 of the *Deutch. Med. Wochenschr.*

Blake (1) gives us in the first part of his paper an historical review, beginning with Wil. Weber's method of representing the vibrations of sound graphically (*Akustik*, 1830). He then mentions Duhamel's vibroscope, (Paris, 1849,) König and Scott's phonautographs as predecessors of the telephone discovered by Reis, describes the physiological works of Donders and Politzer on the representation of the vibrations of the *M. T.* and chain of bones, and so gives us a very interesting contribution to the history of the developement of the phonograph. Edison was the first to construct an instrument for telegraph offices (embossing translator) by means of which the letters of the Morse apparatus printed themselves on a strip of paper, and could then be reproduced by the magnet and lever. In July, 1877, he replaced the magnet and lever by a membrane with pencil, and so discovered that speech could be reproduced mechanically.

Blake next reminds us of the still existing defects in the phonograph (which the reviewer has also noticed in his paper cited as No. 3 in this report), mentions his experiments to use the human *M. T.* as phonautograph and logograph, and finally S. Th. Stein's method (Das Licht im Dienste wissenshaftlicher Forschung) of photographing the vibrations of sound. Blake is also of the opinion that whispers are especially suitable for analyzing the acoustic character of the sounds of speech.

In the second part of his paper Blake compares the value of the graphic and photographic methods for the permanent transfer of waves of sound, gives undeniable preëminence to the photographic representation for purposes of exact research, but speaks of the still important mechanical difficulties in the way (*e.g.* the preparation of large plates; evenness of motion, etc.) which are however not insuperable. The reviewer must here remark, that he can only share Blake's views in so far as the photographic productions in the most favorable case may give a moderately true *flat image* of the sound figures, while their *plastic* representation can only be gained by the graphic method, assuming that we can find a foil or alloy suitable as a matrix.

Amongst the membranes applicable for phonographic experiments, the author regards the human *M. T.* as far superior to any artificial membrane, in spite of the alterations which it undergoes in preparation. Our sound-conducting apparatus likewise offers the greatest perfection in the mechanical transfer of sound-waves Blake believes that he must give a negative answer to the question, whether all audible elements of speech are contained in the figures which the *M. T.* gives when used as a logograph, and cites as proof his experiments with the telephone, in which the photographed vibrations of the *receiving* plate of the telephone when compared with those of the *transmitting* plate, show the variations which result in the excursions of a telephone plate, when the magnet is switched off, or when it is in action.

Blake's papers give us an interesting insight into the manner in which, on the other side of the ocean, the representative investigators in physics, acoustics and otology unite in scientific research. It is indeed highly to be praised that the active mind of the Americans, which for the last ten years was principally directed to practical purposes, now cultivates theoretical acoustics with such success, and that thereby the German and English works are duly appreciated.

Stewart (5) in opening his paper speaks briefly of the sensitiveness of the sound-conducting apparatus, by virtue of which it is in a state to transfer vibrations of the slightest intensity; this sensitiveness standing in direct proportion to the inertia of the mass of the apparatus, or that when this is increased by alterations which have taken place in the sound-conducting apparatus, the loss thus resulting will be denoted by the proportional increase in the intensity of sound. Since the intensity of the sound is in inverse ratio to the square of the distance, the author calls the maximum distance, at which any given sound is perceived in undiminished sensibility of the sound-conducting apparatus, "Normal or Standard Distance," while the distance at which a deaf person perceives the same sound is called "Patient's Distance."

After some circumlocution Stewart comes to the following comparatively simple proposition. Assuming that a person of normal hearing begins to hear the ticking of a watch at 56 inches, and the patient the same watch at 24, then we have the ratio of hearing as follows: As 56 : 24 : : 100, d-h, i-e : 42.85 per cent. The sensibility, then, of the conducting apparatus will be shown by 42.85 per cent., and the loss by 57.15 per cent. A table could then be worked out for the same watch, so that the ratio could be easily read off at a glance. In order to avoid mistakes on the part of the patient, Stewart uses a "stop" watch; the same result, although less perfect, can be gained by turning the hand which holds the watch, so that the hand comes between the watch and the patient's ear. The author moreover thinks that we should use a test-watch of 50 feet normal distance in case of great deafness, and then one of 10 feet, if the hearing improves; this would not alter the ratio, for $\frac{10}{50}$ and $\frac{1}{5}$ are the same as 20 per cent. Stewart then describes Politzer's audiometer, which, he says, is very suitable for testing high degrees of deafness, but its extreme normal distance prevents its being used in other cases. The reviewer regards Stewart's proposition to express the distance for the watch in per cent. as practical, because in this way otologists can easily come to mutual understanding for testing the hearing, but he cannot regard such mathematical exactitude (Stewart even uses a reckoning supported by logarithms) as suitable for testing with the watch, since it is well known that the ticking of a watch sounds decidedly weaker when the watch has been recently oiled.

Politzer's audiometer avoids just such sources of error, because it always offers the same normal distance. The reviewer finally cannot grant that this instrument is inapplicable for the slighter degrees of deafness, because every aurist, if he wishes to obtain exact, scientific, and trustworthy tests of hearing, must have a large space at command for whispers, which require a very great distance between the physician and the patient. We blame Stewart for leaving other tests of hearing unmentioned, since all investigators have recognized human speech, qualitively and quantitively applied, as the most exact test. Testing *with the watch alone* must in most cases lead to erroneous judgment of the disease.

The acoustic investigations of Preyer (6) are so extensive (66 octavo pages), that the reviewer must here confine himself essentially to drawing attention to the results that are of importance in physiology; he will, however, not neglect to recommend this excellent work to the particular attention of those specialists who interest themselves in the further development of physiological acoustics.

In an article which appeared in 1876,* Preyer had proved that the ear is capable of distinguishing as the lower limit of sound the tone of a tuning-fork with 24 vibrations per second. The question whether we could distinguish simple tones of a still less number of vibrations than 24, had then to remain an open one, because suitable tuning-forks were not at hand. Preyer now succeeded, with the help of G. Appun, in Hanau, in obtaining two tuning-forks, the larger of which, 1 *m.* long, had about 13.7, the smaller, .70 *m.* long, about 18.6 vibrations in a second.*

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* Preyer Grenzen der Tonwahrnehmung. *Samml. physiol. Abhandlungen* von W. Preyer. Band i, Heft 1.

By snapping these enormous forks with both hands, they could be set into extensive vibrations, which lasted about three minutes. If the ear were approached to the larger fork when in vibration, the single strokes of air could be distinctly *felt*, but nothing could be *heard* except a dull, interrupted breath, without any perception of a deep tone. The smaller fork gave, indeed, a distinct but interrupted humming sound, but here there was undoubtedly a dull sensation of sound, without roaring and rattling, the separate shocks of air beginning to blend, and becoming noticeably more frequent to the touch with the finger and to the auricle than those of the first fork.

Preyer caused a large number of people to observe both tuning-forks, and found a confirmation of his former assumption, that there are great variations as regards the blending of the infrequent shocks of air into one tone; there was namely no deepest tone of any single frequency, but every ear had its own especial lower limit of tone. But all observers agree that at least 16 vibrations per second are necessary for the production of a tone, since no one could unite the 13–4 vibrations of a single tuning-fork into a tone.

In order to remove the objection that the amplitude of the vibrations in the experimental forks is indeed very great, but warrants nothing as regards the inaudibility of the tone with still greater actual energy of the vibrations, Preyer provided the forks with sounding-boards, 6*m.* and 4½*m.* long respectively. The larger fork gave no tone when the ear approached the board, but only shocks, or a strong, intermittent breath or flowing; the smaller fork, on the contrary, produced in the air of the resonator a sweet, earnest, mild tone, something like subcontra D, which, like all the deepest tones, was, however, not continuous.

Preyer next mentions, for final removal of a doubt raised by Helmholtz (*Tonempfindungen*, 1877), a communication in writing from Alexander J. Ellis, in London, who, basing himself on experiments with the fundamental tone-apparatus, and counting the vibrations, has reached the same results as regards the lower limit of tone, viz.: that vibrations less than 15 per second give no tone.

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* The original paper has a misprint, reading: "The vibrations for the larger fork are about 18.6; for the smaller 13.7."—*Reviewer.*

In the second section, "Combination- and over-tones of tuning-forks," Preyer (induced by the publications of Vieth, Helmholtz and R. König) explains the difference between combination-, differential-, shock- and summation-tones, and draws the conclusion from his numerous experiments with very sensitive tuning-forks, that tuning-forks give rise to harmonious over-tones of considerable intensity, when they are sharply touched with the bow. His experiments have, on the contrary, won no support for the *objective* existence of differential tones; all observations show decidedly that these differential tones first originate in the ear itself, either in the *M.T.* or in the inner ear, as has been already assumed by many observrs.

To explain the fact, that our ear is capable of separately perceiving at the same time a continuous tone, and beats of 24–130 shocks per second, the author argues that the beats which are blended into a tone, are perceived, like every other tone, only by the terminations of the auditory nerve in the cochlea, while, on the contrary, the roaring, buzzing, rattling, rolling, and unblended beats are perceived by other parts of the inner ear. It would thus become comprehensible how less than 16 shocks per second give no tone, but are heard individually, and and how 24–130 disconnected beats produce the sensation of tones; since, then, the cochlea comes into coördinate action, and finally how more than about 130 shocks per minute can only be perceived by *the nerves of the cochlea*, and hence as a tone, since the *fibres of the vestibule* which are here concerned but not yet sufficiently studied, are provided with too sluggish a terminal apparatus. It might be here objcted that the fibres of the auditory nerve, which *do not terminate in the cochlea*, have already been recognized by numerous experimenters as parts of the organ of the sense of equilibrium, but, on the one hand, if all disturbances of movement noticed after wounds of the semi-circular canals be also observed after wounds of the cerebellum; on the other hand, if the restoration of the acoustic function of the ampullar nerves be uncertain, the saccular nerves would still be at disposal to explain the rattling, rough and tremulous noises caused by 16–130 beats, the puffing tone of which is simultaneously perceived by the cochlea.

The reviewer is of the opinion that, although many new and interesting points of view have been opened by these experiments, no exact proof for the cochlea theory has yet been gained. In section 3, "On the theory of consonants," the author, on the strength of numerous experiments with eleven tuning-forks of 1000–2000 vibrations, attacks Helmholtz's theory of consonants, which must undergo a formal and essential modification; finally, he confirms Hensen's statement, that about 16,384 terminal nerves are expanded in the cochlea.

In a "Notice on the perception of the smallest differences in the pitch of tones," Preyer says that none of his observers could distinguish 0.2 vibrations in any tone-color in the whole range of tones from the deepest to the highest, but that, on the contrary, an interval of 0.5 vibrations between 100–1000 could be accurately observed every time by those most practised.

Adolf Klünder (7) publishes a series of experiments *on the accuracy of the voice*, and in so doing touches also upon the question of the perception of the smallest differences of pitch. The determination of the error which the singer makes in striking a tone, rests upon the principle of *describing two tone-curves side by side*, and counting them. The apparatus employed consisted essentially of two tuneable membranes stretched over hollow cylinders. The membranes could be accurately tuned by pushing the edge of a second hollow cylinder by screw motion more or less forcibly against the membrane of the first cylinder. The correctness of the tuning is recognized by the co-vibration (sympathetic vibrations) of the membrane when its tone is sounded elsewhere. Fine aluminium styles are cemented to this membrane, and register the figured vibrations on a König's cylinder, covered with lamp-black. After the apparatus is so arranged, an organ pipe is sounded in front of one of the cylinders, while the observer sings the same tone into the other. The author concludes, from a long series of described curves, that a good voice can commit an error of ⅓ vibration in every 100 vibrations. The author's ear distinguished in 100 vibrations differences in tone which could not be far from $\frac{1}{5}$ of a vibration, *i.e.*, 0.2; while Preyer, as we have just seen, grants only 0.5 to those most practised.

Hensen thinks, as physiologists insist on more accurate schooling of the voice, it is their affair to invent some apparatus to render possible an exact test of the results aimed at, and so describes (8) the following apparatus *to observe the pitch of a vocal tone:*

A König's capsule with burner is placed in front of a tuning-fork vibrating horizontally, and furnished with a mirror. A glass tube with india-rubber attachment is fixed to the air chamber of the capsule. The flame is either fixed in such a way that its image in the mirror is withdrawn from the singer, or so that he can watch it while singing. The tuning-fork being put now into motion, its tone, or its twelfth, octave, fifth, fourth or third are to be sung, and the image of the flame observed. If the tone is struck and held correctly, beautiful, regular images of the flame appear; the fundamental tone shows itself in the mirror in the form of a single flame, the octave gives two flames, the twelfth three, double octave four, etc., all of which stand perpendicular. If the tone is sung too low or too high, the image of the flame is restless, and the summits of the flames move forward or backward. Even a very low tone makes itself perceptible. The whole experiment rests upon the coördinate action of two periodical motions running at right angles to each other. The apparatus is easy to arrange, and therefore worthy of special recommendation to teachers of music practising at striking notes as well as pure intervals.

Fr. Koláĉêk (9), induced by a paper of Felix Auerbach's, "Ueber die Tonhöhe einer Stimmgabel in einer compressiblen Flüssigkeit," [On the pitch of a tuning-fork in a compressible fluid], has experimented anew, and explains the fact that tuning-forks when struck in a fluid undergo a diminution in pitch, upon mechanical principles as follows: "The medium conducting the sound may be regarded as ballast, which the unaltered elastic forces of the tuning-fork, and of an inelastic source of sound in general, have to overcome. Hence ensues a lowering of pitch, when we ballast the fork with wax or a clamp. We can convince ourselves of this by sinking the fork vertically deeper and deeper into a fluid. The tone then becomes deeper and deeper in correspondence with the increase of ballast. If we dip but one arm into water, the tone is noticeably higher than when both are in the water. Also the nature of the source of tone is not immaterial, since e. g., the tone of a vibrating tuning-fork showed in water a lowering of 1.18 : 1; hence drinking-glasses when struck under water undergo a lowering of pitch greater than that of a small third." Koláĉêk then draws up a formula in which the density of the water is taken as 1; from this formula, by the assistance of the known densities of other fluids, it can be proved theoretically what lowering of pitch vibrating bodies will undergo in other fluids. The experiment always confirms the values thus determined, e. g., the lowering of pitch in quicksilver amounted to more than an octave; the density of water as compared with that of quicksilver is as 1 : 13½. In commercial sulphuric acid, the lowering of pitch was 6 : 5, *i.e.*, a small third; in ether and alcohol the pitch was also lowered, but varied only very slightly from what it was in water. Koláĉêk's communications border very closely upon the physiology of the sound-conducting apparatus; at all events, to explain the perceptions of sound which take place in sound-conducting apparatuses under abnormal resistance by collections of fluid, the laws cited in his paper must be taken into consideration.

(10.) The instrument consists of two Leclanché elements, a microphonic key (tuning-fork) in union with the elements, two firmly fixed primary spirals and a secondary (induction) spiral, the ends of which are fixed to a telephone. The induction spiral can be pushed along a board graduated into 200 degrees. The firmly fixed right hand spiral has 6 *m.* wire, the left hand 100 *m.*

In testing the hearing, the secondary spiral is pushed along the graduated board, the number of units of hearing read off, the sound being made by the movement of the microphonic key between the battery and the primary wire.

At the distance of 200°, the maximum of intensity of tone, every one who is not absolutely deaf, hears the tone. On placing the secondary spiral at 0°, the tone is no longer heard through the telephone.

Hughes noticed the *sudden* cessation of perception of tone by the deaf, as well as by those of normal hearing, by a slight displacement, and Richardson could confirm this observation. Distinct hearing and perfect cessation of tone alternate by a push of 2°, *i. e.*, $\frac{1}{100}$ of the scale. The tone is heard longer when we push slowly, than when it is done with a jerk. In deep inspiration and when holding the breath, the hearing is somewhat increased.

Right-handed people hear better with the right ear, left-handed people with the left ear. The only exception was in the case of some physicians who were accustomed to ausculate with the left ear.

Richardson believes that when a disturbance of hearing has lasted for a long time, with e. g. defect in the *M. T.*, the memory for tones suffers, or their perceptibility decreases in the brain.

Hearing is influenced by atmospheric pressure, growing less when the pressure increases.

Richardson also uses the instrument through the mouth, to determine the acuteness of hearing when the tube is closed.

Richardson has tested the various substances from which artificial *M. T.* are made, and found gold the most suitable. Ash in Broad Street, makes gold cylinders for this purpose. They were shown on a patient. Richardson also communicates the discovery of a so-called "sphygmophone," without mentioning the German works on the same subject.

Lesser in the beginning of his article states that Winnett (11) in a paper on the state of the tympanum in the fœtus and newly born, concludes, that where the accumulation of mucous tissue in the tympanum is met with in a marked degree, an energetic intra-uterine or post-partum respiration cannot have taken place, and that where it has disappeared without leaving distinct swelling, a forcible intra-uterine or post-partum respiration has taken place; and further, that the medium which is met with in the tympanum —air, liquor amnii, vaginal mucus, etc., was in front of the apertures for breathing during forcible respiration. Winnett says finally, "I regard the examination of the tympanum as fit within certain limits to take the place of the lung-test, in the case of the head of a fœtus or new-born child found separated from the rest of the body."

While Nothmann agrees fully with these results, Blumenstock makes a few not immaterial restrictions, and Liman grants to the condition in the middle ear, *a supporting but indecisive significance.* All these views however rest on relatively slight experience. Lesser examined the middle ear of forty-two new-born children, thirteen of which were born dead, sixteen lived but a few minutes after birth, and thirteen from several hours to several days. He concludes: 1st. That still-born fœtuses which have reached an age of seven months, have their tympana filled with fluid. 2d. The contents show no such perfect coincidence with the masses found in the air passages as to authorize the assumption that both originated from one source. 3d. The state of the middle ear is not altered by a few extra-uterine respirations. 4th. Air with fluid is only recognizable in the middle ear after several hours of respiration. The rapidity with which the fluid gives way to air, does not stand in a constant relation to the length of extra-uterine life. 5th. Intra-uterine respiration causes no alteration in the composition of the contents of the tympanum; mucous elements being found in the middle ear of apnoic as well as of syphilitic new-born children. The author after emphasizing Blumenstock's merit in having been the first to describe a case in which foreign substances like those in the bottom of a river into which a living child had fallen were found in the tympanum, protests expressly against his assertion, that an examination of the tympana might also furnish data as regards obstetrical malpractice, and then sums up the results of his investigations as follows: The examination of the tympana may demonstrate, though not in all cases,

1st. That a child died several hours after its birth. (In premature births the fœtal condition of the middle ear may continue for more than twenty hours after birth).

2d. That the child was drowned (extra-uterine). (But the fluid in which the drowning took place is not always present in the tympana).

IV.* PATHOLOGY AND THERAPEUTICS OF THE ORGAN OF HEARING.

By Dr. A. HARTMANN, Berlin.

A. General.

1. Syphilitic affections of the ear, Dr. A. H. Buck, New York. *Amer. Journal of Otology*, Jan., 1879.

2. Otitis intermittens. Dr. J. Orne Green, Boston. *Ibid.*, April, 1879.

3. Two cases of gastric vertigo. Dr. Russell. *Medical Times and Gazette*, March 8, 1879.

4. Reflexwirkung im Gebiete des Gehörorgans. (Reflex action in the region of the organ of hearing.) Dr. Weil, Stuttgart. *Monats. für O.*, No. 5, 1879.

5. Ueber eine Verbesserung an meinern euen galvano-caustischen Batterie. (On an improvement in my new galvano-caustic battery.) Prof. Voltolini, Breslau. *Ibid.* No. 3, 1879.

6. Ueber eine Verbesserung, etc. Idem. *Deutsche Med. Wochens.*, No. 2, 1879.

7. Der electrische Spiegel. Eine neue Beleuchtungsmethode von Körper-höhlen. (The electric mirror: a new method of illuminating the cavities of the body.) Dr. Hedinger, Stuttgart. *Ibid*, No. 7, 1879.

8. Bericht über die in der Zeit vom 20. Feb. bis 31. Dec. 1878, in meiner Poliklinik für Ohrenkranke beobachteten Krankheitsfälle. (Report, etc., of clinical cases of otology.) Dr. K. Bürkner, Göttingen. *Arch. für O.*, Band xiv, p. 186.

9. Hearing, and how to keep it. Dr. C. H. Burnett. *American Health Primers.*. Philadelphia, 1879.

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* Section III., Embryology and Comparative Anatomy of the Ear, of which Prof. Löwe, of Bern, has made an excellent report, must, for want of space, be taken over to the next number.

10. De l'éducation des sourd-muets. (On the education of deaf-mutes.) M. Coldefy. *Annal. des maladies de l'oreil.* Nos. 1 and 2, 1879.

11. De la responsabilité légale des sourd-muets. (A letter to Dr. Bonnafont.) Dr. Ladreit de Lacharrière. *Ibid.* No. 1, 1879.

12. Neue Bahnen. Die Künstliche Lautsprache der Taubtummen als Beitrag zur Pathologie der Sprache. (New paths. The artificial phonetic speech of deaf-mutes, as a contribution to the pathology of speech.) Prof. Kilian. Strasburg, 1879.

13. Internationale Statistik der Blinden, Taubstummen und Geistes-Kranken nach den neuesten Ermittelungen. (International statistics of the blind, deaf-mutes and insane, according to the latest census.) *Medicinal-Gesetzgebung. Zeitsch. für Medicinal., etc. Polizei* No. 9, 1879.

(1) Buck found thirty affections of a syphilitic nature amongst 4,000 ear cases, five of which, ulcers and cordylomata, affected the external ear. He divides the remaining cases into three classes: 1st. Those in which a pathological state of the middle ear explains the diminution of hearing, 7 cases. 2d. When a normal or nearly normal state of the middle ear exists, with which the existing deafness stands in apposition: affection of the acoustic nerve, 7 cases. 3d. When the middle ear shows infallible signs of pathological alterations which, however, do not suffice to explain the lack of hearing: middle ear and nerve affected, 11 cases. The author draws attention to the fact, that this sub-division is conventional, since an exact scientific division based on the pathological-anatomical state is at this time not possible.

While the syphilitic nature of the disease in affections of the external ear is easy to recognize by the characteristic behavior of the swelling, we possess no characteristic symptoms for disease of the middle and inner ears. In two cases, perforation of the *M. T.* had ensued without previous pressure from within, which will be regarded as an abnormal occurrence. Buck does not seem to have undertaken more accurate tests of hearing, especially by bone-conduction. As regards the pathological state in syphilitic diseases, the reviewer allows himself to draw the author's attention to Moos' paper on this topic. (*Virchow's Archiv*, Bd. lxix).

(2) One of Orne Greene's female patients suffered regularly every evening from feverish symptoms, pain in the face, teeth and

head, and especially in the region of the ear. These neuralgic symptoms which affected only one half of the head, were accompanied with an inflammation and discharge of the ear on the same side. After a few hours, the patient fell into a perspiration and the symptoms disappeared. There was no malarial fever in the neighborhood, but the sanitary condition of the dwelling proved very unfavorable, so that the author assumes that the symptoms were occasioned by sewer gas. They improved of themselves, when the patient changed her residence.

(3.) In Russell's two cases, neither deafness nor tinnitus were present. The attacks of vertigo were single, came on after long pauses and were noteworthy in that the sensation of vertigo was present now in a lateral, now in a vertical direction. In the first case, the vertigo was caused by an ulcer of the stomach, while in the second it was impossible to decide whether the vertigo was of central or primarily gastric nature. In the first case, the single attacks were accompanied with loss of consciousness.

In a note, a patient of Dr. Mallet's is mentioned, in whom a single examination of the ext. aud. meat. always caused vomiting.

(4.) Weil still clings to the accuracy of his previously expressed view (see these *Archives*, vol. viii, part 2, p. 19) that the cessation of subjective sensations of sound by blowing into the ext. aud. meat., is due to reflex-action, and believes that it depends on reflex-contraction of the vessels. He says that in individuals in whom amyl-nitrite increased tinnitus, the noises ceased rapidly after blowing into the meatus.

(5 and 6.) Voltolini describes in both papers, an alteration in his previously described galvano-caustic battery (these *Archives*, vol. viii, part 3, page 193). While in the former arrangement, the 8 zinc-plates on the one side were united (chain) with the 8 carbon plates on the other, the present improvement consists in that each 4 carbon-plates can be united with 4 zinc plates (columns). By a simple switch-contrivance, the arrangement for columns or that for the chain can be used. The chain is most appropriate for the short and flat platina armatures, while long wires and porcelain burners attain the most intense heat by the column-arrangement.

The reviewer has obtained a new Voltolini battery, which has proved itself very suitable and convenient for minor and short operations; in operations of long duration it has always left him in the lurch. As the polarization is very strong, the intensity of the current decreases rapidly. This can at first be obviated, by lifting and sinking the fluid-reservoir, but at last even this does not succeed, as the chromic acid decomposes rapidly. Voltolini himself mentions the possibility, that, during an operation, the action of the current may finally slacken, and recommends us then to refill the apparatus.

(7.) Hedinger's electric mirror consists of a hemispherical concave mirror, in which a platinum wire is brought to a white heat by the electric current, so that the space lying above the concave mirror is illuminated. Beneath the concave mirror is a moveable plain mirror, by means of which the illuminated cavities of the body can be viewed. Hedinger claims that the illuminating effect of the mirror with the battery as used by him, is much greater than that attainable by a Schalle's lamp.

(8.) Bürkner gives a statistical table of 217 ear cases, the more interesting of which shall be published elsewhere.

(9.) Burnett's small monograph (145 pages) purports to give a popular representation of the hygienic rules needful for the preservation of good hearing. The work is very judiciously written, and the popular and unsuitable methods of treating diseases of the ear are especially found fault with.

(10.) Coldefy describes the education of deaf-mutes from his standpoint as professor in the deaf-mute institute in Paris. As visible speech is not taught at this institute, the author's views differ materially from those which prevail outside of Paris. It would lead us too far here to discuss the advantages and disadvantages of instruction by visible speech or gestures, and so we confine ourselves to a few corrections in point of actual fact.

When the author affirms that after the Abbé de l'Epée had first educated deaf-mutes in Paris, delegates hastened thither from all parts of the world to learn his method of instruction, and after their return instructed in this method, this is only partially correct. In both England and Germany, at that same period, Braidwood in Edinburg (1760), and Heinicke in Eppendorf (1768–1778), and later in Leipzig, laid the foundations for the public instruction of deaf-mutes, and instruction was given in both countries in visible speech, quite different from the Abbé's method. This method has since taken root in most other countries. Further on, the author expresses the view that in a large number of German institutes, visible speech no longer plays the essential part in the education of congenital deaf-mutes. This is incorrect, since, far more than ever, in the last ten years, in Germany, Switzerland and Austria, are deaf-mutes educated almost exclusively by visible speech. We also beg to remind Mr. Coldefy that visible speech has lately been introduced into France, and used in several institutes. (Vid. *Comptes Rend.*, No. 18, page 1045, 1876 ; *Lyon Méd.*, Feb., 1875 ; *Gazette des Hôpitaux.*, August, 1874). In Holland, it seems that at Grœningen the French method was once used, but that now the so-called German method, or visible speech, has completely superseded it. (Comp. *Report of the Brussel's Med. Congress* in *Arch. für Ohren.* Band x.)

Coldefy's description of the intellectual cultivation of deaf-mutes is very carefully and exactly done.

(11.) After Bonnafant had expressed the opinion, that the intelligence of deaf-mutes, with few exceptions, is incapable of a satisfactory development, so as to make them legally responsible for their deeds, Ladreit de Lacharrière emphasizes the fact that this view stands in opposition with all the experience of deaf-mute teachers, as well as with the accomplishments which deaf-mutes have to show in various callings. If we might perhaps assume in the case of *congenital* deaf-mutes that they stand on a lower level, there is no reason why we should doubt the intellectual foundation and capacity for development in deaf-mutes with *acquired* deafness. The author mentions examples of remarkable intellectual development in deaf-mutes, as well as deaf and blind people without instruction.

Finally, the author discusses deaf-mutes in a moral point of view, as regards their responsibility in case of crime. He rightfully rejects the opinion, spread abroad even in Germany, that deaf-mutes are violent, passionate, and rash, and points out the fact, that these peculiarities, even if present, are only due to defective instruction. We must attribute responsibility in crime to deaf-mutes, who can either write or express themselves by gesture.

(12.) Kilian, the Strasburg teacher of deaf-mutes, ventures in his brochure upon medical provinces, and advances a number of hazardous theories. We may quote the introduction, to characterize the paper, "The inability to speak, or aphasia, of deaf-mutes, is not only a mechanical impediment in the motor channel of the centre of phonation, nor a pure morbid disturbances of the intracortical region of the brain," etc.

(13.) From official figures we take the following data concerning deaf-mutes :

ABSOLUTE NUMBER.

Countries.	Year of Census	Male.	Female.	Total.	Ratio to every 10,000 Inhabitants.
A.—GERMANY.					
1. Prussia	1871	12,736	10,843	23,579	9.6
2. Bavaria	1871	2,236	2,112	4,348	9.0
3. Würtemberg	1861	1,019	891	1,910	11.1
4. Saxony	1871	885	799	1,684	6.7
5. Baden	1871	942	812	1,784	12.2
6. Mecklenburg-Schwerin	—	—	—	—	—
7. Mecklenburg-Strelitz	—	—	—	—	—
8. Hesse	1867	—	—	883	10.7
9. Oldenburg	1875	124	95	219	6.9
10. Saxe-Weimar	1871	178	173	351	12.3
11. Saxe-Altenburg	1871	53	41	94	6.6
12. Schwarzburg-Rudolstadt	1871	49	34	83	11.0
13. Schwarzburg-Sondershausen	1871	26	25	51	7.6
14. Reuss: younger branch	1871	40	33	73	8.2
15. Reuss: older branch	1871	12	22	34	7.5
16. Brunswick	1871	98	90	188	6.0
17. Saxe-Meinigen.	1875	125	130	255	13.1
18. Anhalt	1871	68	56	124	6.1
19. Saxe-Coburg-Gotha	1871	84	82	166	9.5
20. Lippe-Detmold	1871			65	5.8
21. Waldeck-Pyrmont	1871	34	26	60	10.7
22. Schaumburg-Lippe	—	—	—	—	—
23. Hamburg	1867	72	51	123	4.0
24. Lübec	1871	28	9	37	7.1
25. Bremen	1871	49	29	78	6.4
26. Alsace-Lorraine	1871	977	747	1,724	11.1
B.—FOREIGN COUNTRIES.					
1. Belgium	1858	1,134	855	1,989	4.4
2. Denmark	1870	587	511	1,098	6.2
3. England and Wales	1871	6,262	5,256	11,518	5.1
4. Finnland	—	—	—	—	—
5. France	1872	12,723	9,987	22,610	6.3
6. Ireland	1871	2,461	2,006	4,467	8.3
7. Italy, (without the Campagna).	1871	10,589	7,487	18,076	7.5
8. Netherlands	1869	629	570	1,199	3.4
9. Norway	1865	820	749	1,569	9.2
10. Austria	1869	—	—	19,701	9.7
11. Russia	—	—	—	—	—
12. Sweden	1870	2,379	1,887	4,266	10.2
13. Switzerland	1870			6,544	24.5
14. Spain	1871	5,806	4,054	9,860	5.9
15. United States of America	1870	8,916	7,289	16,205	4.2

B. External Ear.

14. Ein Fall von Verschliessung des äusseren Gehörganges und Verlust des Gehörs durch Exostosen-bildung, complicirt mit acuter profuser Mittelohrentzündung. (A case of closure of the

ext. aud. meat., and loss of hearing from the formation of exostoses, etc.) Dr. S. Moos, Heidelberg. These *Archives*, vol. viii, 3, 225.

15. Ueber Bindegewebstrangbildung mitten im äusseren Gehörgang (On the formation of connective-tissue cords in the middle of the ext. aud. meat.) Dr. A. Bing, Vienna. *Wien. Med. Blätter*, Nos. 22 and 23, 1879.

16. The use of calcium-sulphide in the treatment of inflammations of the ext. aud. meat. Dr. Samuel Sexton, New York. *American Journal of Otology*. January, 1879.

17. Condylomata of both ext. aud. meat. Dr. H. Knapp, New York. These *Archives*, vol. viii, 2, page 165.

18. Twenty cases of growth of aspergillus in the living human ear. Dr. C. H. Burnett, Philadelphia. *American Journal of Otology*, January and April, 1879.

19. On a possible source of error in the diagnosis of fungus in the ear. Dr. E. Creswell Baber. *Brit. Med. Journal*, March 22, 1879.

20. On behandlingen of exostose in œregangen. (On the treatment of exostoses in the ext. aud. meat.) Dr. V. Bremer, Copenhagen. *Hospitals-Sidende.*, No. 2, 1879.

21. Ein Fall von primärem Epithelial—Krebs, etc. By Delstauche. (A case of primary epithelial cancer, etc.) See *above ;* Report on pathological anatomy.

22. Ueber ein traumatisches wanderndes Hæmatom des Trommelfells. (On a traumatic movable hæmatoma of the *M. T.*) Dr. S. Moos, Heidelberg. These *Archives*, vol. viii, 4 p 332.

23. Tinnitus Aurium from tension of the *M. T.* Relieved by incision. Dr. R. Torrance, New Castle. *Brit. Med. Journal*, May 10, 1879.

15. Violent inflammation, with swelling of the region of the ear, followed the removal of an aural polypus in one of Bing's patients. A subsequent examination revealed two granulations in the ext. aud. meat., one of which projected from the upper wall, the other from the lower wall, into the lumen of the meatus. They soon approached and united into a pale-red, and firm cord. A cure was gained by cutting the cord, and touching the cut surfaces with Liq. Ferr. Sesqui-chloridi.

16. Sexton recommends the internal exhibition (in the first decimal trituration !) of calcium-sulphide, in otitis externa.

18. Burnett introduces his paper with a very complete review

of previous observations of the formation of aspergillus in the ear, and publishes in detail the clinical history of twenty cases under his own observation, which contain many interesting points; the conclusions of the author being all that our limits allow us to notice.

Etiologically, the disease is not one of poverty and filth especially, for seventeen of the twenty cases were seen amongst the better classes. The chief cause is unnecessary picking and scratching of the ear, as well as the instillation of oily or fatty substances (Bezold), and finally the neglect to cleanse the ear after furuncles and inflammation.

The treatment consists in removal by the syringe and wads of cotton. In destroying the fungus, Burnett employs pure alcohol, or subsulph of soda: 0.1:20.0 aq. destill.; the latter especially for the patient's own use.

19. Creswell Baber, when syringing ears, found in the outflowing water some blackish masses, which on microscopic examination revealed the mycelium and spores of a fungus. This state became so frequent that he was led to examine his syringe more carefully, and found on the piston a gelatinous looking substance, in which blackish-brown masses were imbedded. The fungi in these masses resembled so precisely those found in the water flowing from the ear, that there could be no doubt but that they originated from the syringe. Practically, Baber concludes, that we should examine our syringe if there be suspicion of fungoid growths in the ear; and also examine the syringe from time to time for fungi.

20. Bremer's report, published also in *Annales des Mal de l'oreille*, has already been mentioned. These *Archives*, viii, 3, 295.

21. Steinbrügge's report is referred to elsewhere, as a purely pathologico-anatomical paper.

22. Torrance communicates a case in which he gained decided relief from noises in the ear, and improvement of deafness, by incising the *M. T.* behind the handle of the hammer. The application of Siegle's speculum produced a normal condition of the *M. T.*

C. *Middle and Inner Ear.*

23. On primary acute purulent inflammation of the middle ear. Dr. H. KNAPP. These *Archives*, viii, 1.

24. Two cases of tympanic vascular tumor with a pulsating intact drum-membrane. Dr. R. T. WEIR, New York. *Amer. Journal of Otology*, April, 1879.

25. A case of intra-tympanic vascular growth with intact *M. T.* Dr. A. H. BUCK. *Ibid.*, April, 1879.

26. Ueber einen Fall von Catarrh der Eustachischen Ohrtrompete mit Hirnsymptomen. (On a case of Catarrh of the Eustachian tube with brain-symptoms.) Dr. K. BÜRKNER, Göttingen. *Berl. Klin. Wockenschr.*, No. 11, 1879.

27. Ueber den Einfluss der Facialislähmung auf die Binnenmuskeln des Ohres. (On the influence of paralysis of the facial nerve on the inner muscles of the ear.) Dr. M. BERNHARDT, Berlin. *Ibid.*, No. 16, 1879.

28. Eine Modification der Ballonluft douche. (A modification of the air-bag-douche.) Dr. A. OTT, Luzerne. *Arch. für O.*, Band xiv, 186.

29. Ein Instrument zur Entfernung von Flussigkeiten aus der Paukenhöhle. (An instrument for the removal of fluids from the tympanum. Dr. R. SCHALLE, Hamburg. These *Archives*, vol. viii, 3, page 215.

30. Zur Behandlung der Mittelohreiterungen. (On the treatment of purulent inflammations of the middle ear.) Dr. BECKER, Dresden. *Monats. fur Ohren.*, No. 8, 1879.

32. Die antiseptische Behandlung eniger Ohrenkrankheiten. (The antiseptic treatment of some ear diseases.) Dr. G. KÜHN. *Deutsche Med. Wochensch.*, Nos. 15 and 16, 1879.

33. Zur antiseptischen Behandlung der Mittelohreiterungen. (On the antiseptic treatment of purulent inflammation of the middle ear.) Dr. BEZOLD, Munich. *Arch. für O.*, xv, 1.

34. Operatives Verfahren bei Ohrpolypen. (Operative treatment of aural polypi.) Dr. A. POLITZER, Vienna. *Wien. Med. Wochensch.*, No. 16 *et seq.*, 1879.

34 (*a*). Cases of interest, etc., at the Cork South Infirmary. H. MACNAUGHTON JONES, M.D. *Lancet*, May 24, 1879.

35. Ein Seltener Fall von acutem eitrigem Mittelohrcatarrh. Knochenlücke in der Fossa jugularis. (A rare case of acute purulent inflammation of the middle ear. Bone-fissure in the jugular fossa.) Dr. C. KATZ, Berlin. *Berl. Klin. Wochensch.*, No. 11, 1879.

36. Ueber Sinusthrombose, Meningitis, Kleinhirn-Abscess nach Otitis media. See Dr. Steinbrügge's Report. Dr. R.

KRETSCHY, Vienna. *Wien. Med. Wochensch.*, Nos. 11 and 12, 1879.

37. Purulent inflammation of the middle ear. Caries of the mastoid process. Erosion of the veins at the base of the skull. Embolic abscesses of the lungs, etc. CORNELIUS WILLIAMS, M.D., New York. *Arch. O. and O.*, vol. vii, 1, 73.

38. Beiträge zur Pathologie and pathologischen Anatomie des Ohres. (See Dr. Steinbrügge's Report.) Dr. BURKHARDT-MERIAN, Basel. *Arch. fur O.*, Band xiv, 175.

39. Four cases of severe disease of the mastoid process. Dr. S. MOOS, Heidelberg. These *Archives*, vol. viii, 3, 231.

40. On sclerosis of the mastoid process. Dr. A. HARTMANN, Berlin. These *Archives*, vol. viii, 4, page 322.

41. Ueber die chirurg. Eröffnung des Warzenfortsatzes. (On the surgical opening of the mastoid process.) Dr. H. SCHWARTZE. Conclusion, *Arch. für O.*, Band xiv, 202.

42. Des Abscès mastoidiens liés aux affections de l'oreille. (Mastoid abscesses in connection with diseases of the ear.) Dr. H. GERVAIS, Paris, 1879.

43. Ein neues Verfahren zur Eröffnung des Warzenfortsatzes. (A new method for opening the mastoid process.) Dr. BOGROFF, Odessa. *Monats. für O.*, No. 5, 1879.

44. Disease of the mastoid bone. Lecture by DALBY before the Royal Med. and Chirurgical Society. *Lancet*, January 18, 1879.

45. Deafness from a blow on the mastoid process. Cure following accidental epistaxis. Dr. R. ELLIS, Newcastle. *Brit. Med. Jour.*, June 14, 1879.

46. Schlæfenheinfissuren. (Fissures of the temporal bone.) ZAUFAL, Prague. *Prag. Med Wochensch.*, No. 8, 1879.

(25). In Weirs' first case, the *M. T.* was very dark red, the whole membrane bulged forward, the hammer visible in a furrow, and the membrane showing a distinctly visible, marked pulsation, synchronous with the pulse. This pulsation could be reduced by compression of the carotid. Weir believed that this was a case of collection of bloody serum, and so performed paracentesis. The subsequent profuse hemorrhage was checked by tampons of cotton. The air-douche did not succeed. The paracentisis was repeated several times, the growth destroyed by nitric acid, and a cure gained, with improvement of hearing.

The second case was that of a female patient, who was very much annoyed with rhythmical noises on the left side of the head, synchronous with the pulse. Examination showed the posterior and lower surface of the *M. T.* reddened, bulging and pulsating. Considerable hemorrhage followed the paracentesis, which was repeated several times. Chromic acid solution 1:7, was used as a caustic through the perforation-opening with decided improvement. The treatment could not be followed out to the end.

26. A female patient of Buck's also had tinnitus, synchronous with the pulse. Examination showed the whole lower half of *M. T.* of a vivid red. Two years later the whole posterior half of the *M. T.* was convex and pulsating. Buck accentuates the origin of the growth without demonstrable cause, its vascular character and the slow development.

27. Bürkner describes the case of a servant girl with very violent tinnitus, excessive headache, feeling of heat, and giddiness, following an acute cold in the heat. These symptoms were so marked that the case seemed one of cerebral disease. The deafness was very great, but bone-conduction for sound was preserved. Both *M. T. T.* were very concave. The air-douche with the catheter was very unsatisfactory at first. With increased permeability of the tubes the symptoms gradually improved. (Politzer's method does not seem to have been used.)

28. Hitzig once communicated a case in which, with extreme facial paralysis, without participation of the uvula, there was a disturbance of taste on the affected side, abnormal acuteness of hearing for all deep tones (explained by Lucae as due to increased labyrinth-pressure with paralysed stapedius muscle, and uncompensated action of the tensor tympani), and a deep tone (contraction of the stapedius) heard by the patient at every attempt at motion with the frontalis. Bernhardt now publishes a case of equally marked facial paralysis, without paralysis of the uvula, without disturbance of taste, without hyperacusis. When attempting to close the eyes or to whistle, a low buzzing was heard in the ear. Bernhardt believes, therefore, that no especial value attaches to the symptoms in so far as refers to a diagnosis of the seat of the facial paralysis. It may be present or absent when hyperacusis (paralysis of the stapedius) exists, and so also when there is no hyperacusis.

29. In order to avoid removing the bag during catherization, Ott uses a bag with two openings, from one of which a rubber tube leads to the catheter, while the tube running from the second

is held in the operator's mouth. This tube between the teeth is to be pressed together or not, depending upon whether air is to enter the bag or not. The teeth, therefore, are to take the place of the valves in air-bags used for the same purpose.

31. Becker believes that he has discovered a new cleansing method in purulent inflammation of the middle ear, which fulfills most satisfactorily all the purposes aimed at by syringing, without possessing its accompanying dangers. Amongst the latter are mentioned, the commingling of the injected fluid with the pus in the sinuses and cavities of the ear rather excites than diminishes the secretion, and besides this, syringing is inconvenient, and sometimes really dangerous. Becker has most rigorously avoided syringing in more than 300 cases, and cleansed the ear daily by a dry process, wiping it out and drying it carefully with small tampons of wadding held with bent forceps. This treatment has never failed the author, and he recommends it also for diseases of the ext. aud. meat.

32. Kühn describes the method used at the Greifswald surgical clinique in treating purulent inflammation of the middle ear, which consists in transferring the antiseptic principles of the general treatment of wounds to the inflammatory processes of the organ of hearing. The method consists in first cleansing the meatus, then filling it with a one per cent. solution of salicin, and preventing the escape of the fluid by a closely-fitting cotton plug, so that the causes of irritation and inflammation shall be destroyed and prevented. The method was employed in 125 cases with the best results, and is especially to be recommended in carious processes of the mastoid process.

33. There are two circumstances which, in Bezold's opinion, might cause the antiseptic treatment of purulent inflammation of the middle ear to appear illusory, viz., the impossibility of complete disinfection of all the sinuses of the middle ear, and the impossibility of perfect exclusion of air, since the tympana are connected with the air in the naso-pharyngeal space by the tubes. Besold resorted then to a long series of cases to decide the question.

After using carbolic acid, salicylic acid and thymol, he tried boracic acid, and reports on the extremely favorable results gained with the last remedy. The treatment is as follows:

(*a.*) The meatus and tympana are cleansed with a saturated four per cent. solution of boracic acid. (Pure water was also used without any detriment;)

(*b.*) After careful wiping dry and use of the air douche, finely pulverized boracic acid is blown in and poured in.

(*c.*) The ext. aud. meat. is filled with salicylic, carbolic or boracic lint.

Twenty-nine cases of acute purulent inflammation of the middle ear were so treated, and the average length of cure was thirteen days. A very favorable result was also gained in acute inflammation of the middle ear in typhus fever.

One hundred and sixteen cases of otitis media purulenta chronica were treated, the average duration being nineteen days. Three forms of this disease offered resistance to the antiseptic treatment: (1.) Those complicated with destructive bone disease. (2.) Those forms developed during advanced disease of the lungs; and (3.) The purulent inflammation of the upper part of the drum cavity with perforation of Shrapnell's membrane. Seven cases of the latter disease are described in detail.

Finely pulverized boracic acid exercises neither a mechanical nor chemical irritation upon the mucous membrane of the middle ear, nor do we find those firm and tenacious masses so difficult to remove as when pulverized alum has been used. The reviewer has had an opportunity of convincing himself in a large number of cases of the extremely favorable action of insufflations of boracic acid, especially in *chronic* purulent inflammation of the middle ear, while in the *acute* form repeated relapses followed the application of the powder.

34. In order to decide whether a polypus springs from the ext. aud. meat., or from the tympanum, Politzer employs a probe-pointed, winged sound, bent at right angles, and marked off for every 5 *mm.* When the sound is pushed in, the polypus is embraced; if we meet with a resistance at a depth less than the distance of the orifice of the meatus from the *M. T.*, we can assume it to be due to the root of a polypus. Polypi which spring from the ext. aud. meat. can be torn out with the snare, and so removed radically. All methods of extraction are rejected in the case of large polypi, the origin of which cannot be determined; such polypi must be removed, with the snare that is cut through. In the case of fibrous polypi, those snares in which the noose can be withdrawn into the tube (Hartmann), are preferable to those in which there is an intervening bridge at the end (Wilde, Blake). As a radical removal cannot be gained by abscision, Politzer devised for this purpose a new instrument, which consists of a con-

cave-convex ring, the inner edge of which is cutting. The diameter of the ring for larger growths measures 3–3½ *mm.*, for the smaller and when the meatus is small, 2 *mm.* For polypi which spring from recesses, the ring-knife is to be placed at an obtuse angle to its axis. Politzer used this instrument in eighty-two cases, and the removal of the polypus succeeded quicker and more radically than with the wire snare. He uses a small drop of liq. ferri. sesqui-chl. upon a sound, to remove the remains of polypi, and destroys them thus with less pain and more surely than by the use of lunar caustic.

34*a*. Prof. H. Macnaughton Jones communicates at the close of his lecture, the operation of three aural polypi (fibroid, fibro-gelatinous and vascular), with Wilde's snare and Toynbee's forceps. He cleanses the ear with cotton fixed to a probe, and uses this also to apply chloro-acetic acid for the destruction of the remains of the polypus. ("Nothing of special interest has occurred in the aural department!")

35. Katz observed in the case of a girl æt. 9, with acute perforative inflammation of the middle ear, that pressure on the jugular vein evacuated pus very rapidly from the perforation-opening. The flow ceased when the pressure was stopped. Katz regards it as very probable, that a dehiscence in the floor of the tympanum was the cause of this occurrence. (?)

36. Kretschy reports three cases of brain disease due to otitis media. These correspond to three accompanying morbid processes, (thrombosis of the sinus, meningitis, and formation of abscess.)

In the first case, where the autopsy revealed the formation of cholesteatoma and thrombosis of the sinus, stiffness of the neck, violent headache, sinking of the abdomen, and high fever ensued on the ninth day, after being preceded by violent headache and feverishness. Chills with profuse perspiration and excessive tenderness about the neck when gentle pressure was made near the jugular vein, appeared on the following day. No hardness could be demonstrated in the vein. Pyæmic symptoms followed. As the sensitiveness remained confirmed to one side of the neck, and did not follow down to the extremities and trunk, and as peripheral paralytic symptoms were absent, a basilar meningitis could be excluded.

In the second case, in the course of a left-sided purulent otitis, typhus abdominalis appeared and led to convulsions, trismus and coma. Contraction of the neck, paralysis of the left facialis as well as of the upper and lower extremities preceded death. The autopsy showed meningitis of the convexity, and the hemiplegic symptoms were explained by the seat of the meningitis over those convolutions of the brain, which lie directly above the cerebral ganglia.

In the third case there was constant pain during life at a circumscribed spot at the occiput. The head was held stiffly, as all its motions caused pain, and there was remarkable apathy on the part of the patient. The fever symptoms were but slight, and death ensued in a comatose condition.

The diagnosis of abscess in the cerebellum was based chiefly on the constant local pain in the occiput.

The pathologico-anatomical conditions have been previously described in this report.

41. Schwartze's paper, now lying before us, closes the previously communicated series, embracing fifty cases, in which Schwartze undertook a surgical opening of the mastoid process. Thirty-five of these cases were cured; five remained uncured, and ten died. Death was independent of the operation in six cases; in three the connection was doubtful, and in one death was due to the operation. The average duration of treatment was 9–10 months.

According to Schwartze, the indications for the operation are as follows: (1.) Acute inflammation of the mastoid process, with retention of pus in the bone-cells, with continuous œdematous swelling, pain and fever. Under these conditions the operation was performed eleven times. (2.) When repeated swelling of the mastoid region ensues, even when the symptoms do not threaten life; when sub-acute abscesses or fistulæ are present at the mastoid process; 25 cases. (3.) When the mastoid process is sound externally, but with bulging of the skin in the posterior upper wall of the meatus, and retention of pus in the middle ear. (Pain, fever, offensive pus.) Eleven cases were thus operated on, and three were done to save life if possible.

When a fistula is present, the operation consists in enlarging it with the grooved probe or chisel, and scraping out the softened bone with the spoon. Schwartze recommends the gouge for opening the healthy process, and that the entrance into the canal should be on a level with the ext. aud. meat. While he formerly recommended to penetrate ¼–½ inch behind the auricle, and to push the periosteum 1½ *cm.* still further back, he seems to have convinced himself that this is unsuitable and dangerous, and now advises to penetrate "somewhat behind the auricle." He then withdraws his previous views of penetrating as deeply as 3 *cm.* and more, in case of sclerosis, and announces now that we should not penetrate deeper than 2.5 *cm.*

Schwartze speaks most sharply against the use of drills, since we then "drill into the darkness," and finds it "wholly incomprehensible" why the reviewer "advises the drill." On this point the reviewer refers to these *Archives*, vol. viii, page 330, and confines himself merely to pointing out that at the end of the paper in the collection of instruments used by Schwartze one can see, "a hand-drill, with six drill-points," etc. At the time when Schwartze began to perform the operation, "the necessary anatomical knowledge and surgical experience were wanting." (*Arch. fur O.*, Band x. 28), and the sinus was opened by erroneous procedure. When we become well acquainted with the anatomical relations, many things will be illumined that are now dark to us. Esmarch has operated with the drill with the best results, and has not been able to confirm the experience of which Schwartze speaks, that we have a disproportionally frequent erysipelas of the wound and violent absorption-fevers after using the drill.

According to Schwartze, the removal of the posterior wall of the meatus is highly to be recommended in many cases. The opening of the antrum from the meatus outward is rejected.* The very tedious and wearisome after-treatment consists in irrigations twice or thrice daily with a ¾ per cent. chlor. sod. solut., with 1 to 2 per cent. carbolic acid water. The canal is often kept open by a leaden nail.

42. Gervais' very detailed thesis is divided into anatomical considerations, descriptions and treatment of mastoid abscesses. He distinguishes intra- and extra-mastoideal abscesses, and divides the latter again into those situated beneath the skin, and those beneath the periosteum. While

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* I mentioned in the *Berl. Klin. Wochenschr.*, No. 33, 1876, that "I had undertaken on the cadaver to open the antrum from the meatus," and there pointed out that in this way we are able to open the antrum from two sides, and "can resort to the one or the other, depending upon the circumstances." Scwhartze now represents that I (*l. c.*) had proposed "regularly to unite the opening of the antrum from the outer surface of the mastoid process, with the opening of the antrum from the external aud. meat." It is this proposition which seems objectionable to Schwartze. H.

the former, according to Hagen, are frequently connected with furuncle or formation of abscess of the posterior wall of the ext. aud. meat., the latter are usually associated with purulent inflammation of the middle ear. Two cases are mentioned, in which ocular disturbances were associated with the formation of abscess on the mastoid process, strabismus internus on the affected side in one, and contraction of the pupil in the other case. These symptoms disappeared after the abscess was opened. Gervais believes that they must be regarded as reflex symptoms, communicated through the nerves of the dura mater.

Intra-mastoideal abscesses, *i.e.*, collections of pus in the mastoid process, are next described. Amongst the complications, thrombosis of the sinus is less frequent than meningitis and abscess of the brain ; the cerebellum is more rarely affected than the cerebrum. The opinion that collections of pus in the mastoid process of children are rather rare, can hardly be correct. Gervais explains this from the fact that in children the cavities of the mastoid process communicate with the tympanum only from the fifth year onward, which, at all events, is erroneous. In case of continuous pain, swelling, and redness of the mastoid process, Wilde's incision is recommended ; if no improvement ensues within 24–48 hours, the mast. proc. is to be opened. Tillaux (Gervais' teacher) uses the hammer and chisel for this purpose. The section in the skin is T-shaped. The author, following Désarènes, prefers as boundary mark of the operation the spina supra meatum or the small furrow which is found at the root of the zygomatic bone. (Since the greater the development of the furrow the more marked the prominence of the spina, there could hardly be any decided difference between the use of both spots as boundaries.—*Reviewer.*)

Seventeen cases belonging to the various forms of abscess are described in detail.

43. Bogroff proposes, *on entirely theoretical grounds*, *however*, to open the mast. proc. by successive cauterization of the bone with the galvano-caustery.

44. Dalby reports on a case of epithelioma, which had originated from the tympanum after a purulent inflammation of the middle ear, which had lasted a long time. The mast. proc., the ext. aud. meat., and a part of the petrous bone were destroyed.

45. A boy of 14 received a blow on the mast. proc. of the right temporal bone. The patient recovered but very slowly from

the concussion of the brain that ensued. Deafness, tinnitus and vertigo continued, as well as a dull feeling of pressure in the head. Ellis succeeded in removing the tinnitus and vertigo, after a treatment of twelve weeks. The deafness and head symptoms did not disappear until the patient had accidental and profuse bleeding from the nose.

46. Zaufal shows by a preparation that the course of the fissures of the temporal bone follows certain paths, which are determined by the anatomical relations of the temporal bone. The most frequent fissure is that which begins at the anterior surface of the pyramid, runs from the summit into the sulcus ad hiatum canalis Fallopiæ, touches the gl. geniculi, runs over the tegmen tympani, and passes through the anterior and posterior walls of the osseous ext. aud. meat., at the place where the upper wall of the pars tympanica separates itself from the squamous substance and the mast. proc. We sometimes find a rupture at the spot where the upper edge of the *M. T.* inserts itself into the innermost edge of the lower plate of the horizontal portion of the squamous bone without any other rupture of the drum-skin. Such a preparation was shown. The arterial hemorrhages originate from the middle meningeal artery.

In a patient who remained alive, a similar course of the fissure could be diagnosed from the state of the parts and the existing symptoms. On examining the ext. aud. meat., a furrow was found on the posterior wall, running from without inward to Shrapnell's membrane. The deafness was total, even for bone conduction. Swelling of the conjunctiva and eyelids ; facial paralysis and anæsthesia of the cheek and upper lip existed after the injury. The sense of taste was absent on the right tip of the tongue, but there was no defect of motion in the soft plate. The diagnosis was made, that the facialis had been wounded just behind the gl. genic., that is to say after the branching of the n. petr. superfic. major, but before that of the chorda tympani. The conclusion of a continuation of the fissure into the cranial cavity, through the anterior surface of the pyramid, was drawn from the facial anæsthesia, and the symptoms on the part of the eye.

D. Nose and Naso-Pharyngeal Space.

47. Ueber partielle und totale Verlegung der Nase. (On partial and total closure of the nose.) Dr. Ziem, Danzig. *Monats. fur O.*, No. 1, et seq., 1879.

48. Die Rhinoscopie und Pharyngoscopie. Prof. R. VOLTOLINI, Breslau. 2te Auflage. 1 Hälfte Verlag von E. Morgenstern, Breslau, 1879.

49. Adenoid polypi on the nasal septum. Dr. JACOBSON. *Brit, Med. Journ.*, March 1, 1879.

50. Ueber die Behandlung der adenoiden Vegetationen im Nasensachenraum. (On the treatment of adenoid vegetations in the naso-pharyngeal space.) Dr. G. GATTI, Vienna. *Monats. fur. O.*, Nos. 1 and 2, 1879.

51. Die rhinoscopischen Untersuchungs- und Operations-Methoden. (Methods of rhinoscopic examination and operations.) Dr. B. BAGINSKY, Berlin. *Volkmann's Samml. Klin. Vorträge*, No 160.

52. Ueber ein neues Instrument zur Entfernung der adenoiden Vegetationen im Nasenrachenraume. (On a new instrument for removing adenoid vegetations in the naso-pharyngeal space.) Dr. DELSTANCHE, Brussels. Translated by Dr. Blau. *Arch. fur O.*, Band. xv, pag. 35.

53. Du catarrh nasal chronique et de l'ozène, de leur traitement, etc. Dr. EMILE TILLOT. *Annal. des mal de l'oreille*, Nos. 1 and 2, 1879.

54. Ueber Inhalation des Oleum Eucalypti bei Rachendiphtherie. (On the inhalation of œleum eucalypti in pharyngeal diphtheria.) Prof. MOSLER, Greifswald. *Berl. Klin. Wochensch.*, No. 21, 1879.

55. Die Plica salpingopharyngea. (The salpingo-pharyngeal fold.) Preliminary communication by Prof. E. ZAUFAL, Prague. *Prag. Med. Wochensch.*, No. 22, 1879.

56. Zusatz zu der vorläufigen Mittheilungen Die Plica, etc. (Supplement to No. 55.) *Idem, Ibid.*, No. 23, 1879.

47. Ziem introduces his paper, by describing the disturbances of respiration due to stenosis of the nose, and draws special attention to the well-known observations of Kussmaul on children. The difference between breathing through the mouth and breathing through the nose is next discussed, and previous observations of asthma from swelling in the nose are cited. Ziem believes that asthma ensuing from swellings in the nose is neither to be regarded as a reflex-neurosis, nor does it rest upon a desication of the mucous membrane of the air passages ; therefore he tries to give a mechanical explanation for its origin, according to which the asthmatic paroxysm is due to the fact that the contractions of

the muscles of the tongue and palate necessary in breathing through the mouth cannot occur satisfactorily from weariness. Then he gives a detailed description of the various morbid processes which lead to partial or total closure of the nose.

Finally, two cases from Voltolini's practice are communicated. The first refers to a closure of the right nostril by a dome-shaped prominence of the cartilaginous septum, due to repeated traumatic influences in childhood. The most prominent portion was treated with galvano-cautery in short sittings for several weeks, and the air passage thus restored. In the second case complete closure of the nose followed long continued colds and pain across the bridge of the nose, with subsequent pain above the mouth, and very great deafness. The skin of the nose was greatly swollen. The speculum revealed a homogeneous, compact swelling in the left nostril, leaving a small fissure, and the mucous membrane was covered with granulations. The velum palati was drawn upward, and attached in the region of the choanæ. The passage through the nose was restored by galvano-caustic destruction of the swelling. The union between the palate and the wall of the pharynx was likewise removed with the cauterizer, and catheterism, before impossible, was now rendered easy, and the hearing was restored.

48. Voltolini gives in the second edition of his treatise a description of his method of examination, based upon his extensive experience. We cannot here review the whole book, but must confine ourselves to recommending its study to everyone who is interested in the province of which it treats.

In the second section, Voltolini describes a method which he has just discovered, by which the hindrance which hitherto opposed the general use of rhinoscopy can be removed. According to him, the failure to draw the uvula forward with the various instruments devised for this purpose, is due to the use of too weak a traction. He convinced himself "that the uvula endures more easily a forcible, firm traction with a massive heavy spatula which reaches to the tonsils, than a gentle irritation and a traction which only embraces the uvula itself." Even children bear nicely the application of the palate hook. Part three, describes especially the advantage of direct sunlight for illumination. For anterior rhinoscopy, Voltolini resorts in addition to the usual instruments, to a speculum with a magnifying lens, like Brunton's ear speculum. Section 1, on the inspection of the pharynx with and without a mirror, is especially worthy of attention.

49. Jacobson reports two cases of youthful age, in which a firm, but easily bleeding polypoid mass was found on the cartilaginous part of the nasal septum. Neither the forceps nor the snare could remove it, and a narrow-bladed knife had to be employed. In both cases the growth consisted of firm, adenoid tissue, and mucous glands.

50. Catti begins his paper with an account of previous methods for operating on adenoid growths, and points out the disadvantages of galvano-cautery, of Meyer's ring-knife, Störk's steel snare-guillotine, and finally the insufficiency of caustics. The objections to Justi's sharp spoon are that its use is sometimes followed by violent inflammation of the ear. As regards the use of cold snares, Catti is of the opinion that every one can soon convince himself of its tediousness and lack of success in its operation. The reviewer, on the contrary, has convinced himself by experience, that the cold snare leads to its aim most safely, most quickly and most agreeably to the patient, when the operation can be performed under control of the mirror. As the snare can be made moderately large, the growths can be removed in a few sittings. If the operation does not succeed under control of the mirror, the reviewer also resorts to the newer operative methods, all of which are excessively disagreeable to the patient.

Catti recommends for the operation the curved forceps, (the horizontal and ascending portion forming an angle of 100°), to be introduced through the mouth. The portions seized are then crushed and pulled out. Löwenberg and Kessel described the use of such forceps some time previously.

51. Baginsky gives a detailed and very comprehensive description of the well-known methods of examining the nose and naso-pharyngeal space. The examination with Zaufal's specula is especially described, their introduction causing pain by no means slight, and a hemorrhage that is very troublesome. In many cases they cannot even be introduced. In spite of these disadvantages, Baginsky believes that this examination in the cases where it is feasible, might supplement posterior rhinoscopy. All the operative methods are described equally minutely, the galvano-caustic destruction of hypertrophy of the mucous membrane, the removal of nasal polypi with the snare, and the various methods of treating adenoid growths.

52. The adenotome of Delstanche, is also an instrument to remove adenoid growths through the mouth. Two cutting termi-

nal branches of a forceps fixed to a firm handle, can be shut by a ring, which can be pushed to and fro over them. The ring can be pushed along in spite of the curvature of the shaft, being set in motion by a spiral, which surrounds the shaft and is united with a lever resting on the handle. By bending the instrument, the forceps and its processes can be set in all possible directions.

53. Tillot reports in detail the historical views on ozœna and its treatment, and agrees with the now universally accepted experience, that ozœna does not depend on the presence of growths, but on the collection and decomposition of secretion. He was dissatisfied with the use of the usual nasal douche, and recommends an atomizing apparatus on Sales-Giron's principle. Five cases of the successful use of this instrument are then described.

54 Mosler's paper contains a note on the treatment of nasal and naso-pharyngeal catarrh. He saw very good results from sea-air and sea-water, and so directs gargles every morning and evening for months, of 1–4 tablespoonfuls of 20 per cent.–30 per cent. solutions of sea-salt. The teeth should be cleansed afterwards to protect them from injury. The gargling should be combined with contractions of the muscles of the throat, (deglutition motions), so that a part of the gargle is driven through the nostrils.

55 and 56. Zaufal reports in his preliminary paper and its supplement, his observations on the plica-salpingopharyngea, which he calls the ridge-fold. This projects forward, especially in throttling movements, like a sharply defined medial fold, which varied in thickness. It stretches 3–5 *cm.* along in direct continuation of the tubal convolution, downward and backward. When the head is bent backward, this fold can be inspected by drawing forward the uvula with a hook. It is also visible during the rhinoscopic examination, as well as by palpation with the finger. It is pushed forward by the action of the upper constrictor of the pharynx.

INDEX OF AUTHORS TO VOLUME VIII.

Berthold, Dr. E. Analysis of the Tones Included in the Secondary Noise of an Intermitting Tuning-Fork 250

Burnett, Swan M., M.D. Abstract of American Otological Literature for the First Quarter of 1879 183

——— Abstract of American Otological Literature for the Second Quarter of 1879 . . 284

——— An Abstract of American Otological Literature for the Third Quarter of 1879 . . . 370

——— Objective Aural Sounds Produced by Voluntary Contraction of the Tubal Muscles. 357

Capron, Dr. F. P. Report on the Proceedings of the Section on Otology of the British Medical Association, held at Cork, August, 1879. (Being an Abstract of the Report published in the *British Medical Journal*, August 30, 1879.) . . . 360

Coggin, David, M.D. A New Test for Simulated One-sided Deafness 177

Ely, Dr. Edward T. Note on the Treatment of Acute Suppuration of the Middle Ear . 178

Gerster, A. G., M.D. Extensive Caseous Osteitis of the Mastoid Process and Petrous Bone, Caused by Chronic Purulent Inflammation of the Middle Ear.—Operation.—Permanent Fistula of the Mastoid.—Recovery 81

Gruening, Dr. Emil. On the Indications for Opening the Mastoid Process in Cases of Otitis Media Purulenta Acuta, with Implication of the Mastoid Cells 84

Hackley, Charles E., M. D. The Use of Toynbee's Artificial Ear-Drum 228

Hartmann, Dr. Arthur. On Sclerosis of the Mastoid Process 322

——— On the Formation of Sequestra in the Mastoid Process of the Child 26

——— Pathology and Therapeutics of the Organ of Hearing. (Report on the Progress of Otology in the First Half of the Year 1878.) . . . 187, 288

——— Pathology and Therapeutics of the Organ of Hearing. (Report on the Progress of Otology in the Second Half of the Year 1878.) 399

Holmes, Dr. E. L. A Case of Objective Aural Sounds . . . 144

Kipp, Charles J. Four Cases of Intracranial Disease Caused by Chronic Suppuration of the Middle Ear. Two Recoveries and Two Deaths 147

Knapp, H. A Case of Parotidean and Intratympanic Malignant Tumor 311

——— Condylomata of Both External Ear Canals 165

——— Primary Acute Purulent Inflammation of the Middle Ear 1

Löwe, L. Embryology and Comparative Anatomy of the Organ of Hearing. (Report on the Progress of Otology in the First Half of the Year 1878.) . 104

Moos, S. A Case of Closure of the Auditory Meatus and Loss of Hearing by the Formation of Exostosis Complicated with Acute Perforative Inflammation of the Middle Ear, with Repeatedly Recurring Granulations.—Restoration by the Use of Laminaria and Galvano-Cautery 223

——— Contributions to the Pathology and Pathological Anatomy of the Organ of Hearing 113

——— Four Cases of Disease of the Mastoid Process 231

——— On a Traumatic Moveable Hæmatoma of the Membrana Tympani 332

ROOSA, Dr. D. B. St. John. A Case of Acute Inflammation of the Middle Ear, with Inflammation of the Muscles of the Neck, and Facial Paralysis of the same Side.—Recovery. With Some Remarks upon the Indications for Wilde's Incision and Trephining of the Mastoid Process 255

——— Syphilitic Diseases of the Internal Ear. Being a Review of Some Recent Papers upon this Subject 336

SCHALLE, Dr. An Instrument for Removing Fluids from the Tympanum 215

SCHWABACH, Dr. D. On Branchial Fistulæ at the External Ear 246

STEINBRÜGGE, H. Normal and Pathological Anatomy of the Organ of Hearing. (Report on the Progress of Otology in the First Half of the Year 1878.) 89, 205

——— On the Sinus Tympani . . 53

——— Report on Normal and Pathological Anatomy. (Report on the Progress of Otology in the Second Half of the Year 1878.) 381

——— The Histology of the Inferior Turbinated Bones, and of the Teleangiectatic Fibromata Arising from them. (With Plates I and II.) 269

STEVENS, Geo. T., M.D. A Case of Tumor of the Auditory Nerve Occupying the Fossa for the Cerebellum 171

TURNBULL, Chas. S., M.D. The Audiphone and Dentaphone . 373

WEBSTER, Dr. David. Clinical Contributions to Otclogy. From the Practice of Dr. C. R. Agnew 65

WOLF, Dr. Oscar. Experiments with Edison's Phonograph . . 58

——— Physiology of the Organ of Hearing. (Report on the Progress of Otology in the First Half of the Year 1878.) . 98, 207

——— Physiology of the Organ of Hearing. (Report on the Progress of Otology in the Second Half of the Year 1878.) . 388

INDEX OF SUBJECTS TO VOLUME VIII.

Absract of American Otological Literature for the First Quarter of 1879. By Swan M. Burnett, of Washington, D. C. 183

——— of American Otological Literature for the Second Quarter of 1879. By Swan M. Burnett, of Washington, D. C. . 284

——— of American Otological Literature for the Third Quarter of 1879. By Swan M. Burnett, of Washington, D. C. . 370

Analysis of the Tones Included in the Secondary Noise of an Intermitting Tuning-Fork. By Dr. E. Berthold, of Königsberg 250

Anatomy. Contributions to the Pathology and Pathological—of the Organ of Hearing. By Prof. S. Moos 113

——— Embryology and Comparative—of the Organ of Hearing. By L Löwe, of Berlin . 104

——— Normal and Pathological —and Histology of the Organ of Hearing. By H. Steinbrügge, of Heidelberg . 89, 205

——— Report on Normal and Pathological. By. Dr. H. Steinbrügge 381

Audiphone, The—and Dentaphone. By Chas. S. Turnbull, M.D., of Philadelphia . 373

Auditory Nerve. A Case of Tumor of the—Occupying the Fossa for the Cerebellum. By Geo. T. Stevens, M.D., of Albany, N. Y. 171

Clinical Contributions to Otology. From the Practice of Dr. C. R. Agnew. Reported by Dr. David Webster, of New York 65

Closure. A Case of—of the Auditory Meatus and Loss of Hearing by the Formation of Exostoses, Complicated with Acute Perforative Inflammation of the Middle Ear, with Repeatedly Recurring Granulations—Restoration by the Use of Laminaria and Galvano-Cautery. By S. Moos, of Heidelberg 223

Condylomata of Both External Ear Canals. By H. Knapp . 165

Contributions. Clinical—to Otology. From the Practice of Dr. C. R. Agnew. Reported by Dr. David Webster, of New York 65

——— to the Pathology and Pathological Anatomy of the Organ of Hearing. By Prof. S. Moos 113

Deafness. A New Test for Simulated One-sided. By David Coggin, M.D., of Salem, Mass. 177

Dentaphone. The Audiphone and. By Chas. S. Turnbull, M.D., of Philadelphia . . . 373

Disease. Four Cases of—of the Mastoid Process. By S. Moos, of Heidelberg 231

Douche. A New Aural . . . 355

Ear-Drum. The Use of Toynbee's Artificial. By Charles E. Hackley, M.D. 228

Embryology and Comparative Anatomy of the Organ of Hearing. By L. Löwe, of Berlin 104

Exostoses. A Case of Closure of Auditory Meatus and Loss of Hearing by the Formation of,—Complicated with Acute Perforative Inflammation of the Middle Ear, with Repeatedly Recurring Granulations—Restoration by the Use of Laminaria and Galvano-Cautery. By S. Moos, of Heidelberg 223

Experiments with Edison's Phonograph. By Dr. Oscar Wolf, of Frankfort-on-the-Main . . . 58

External Ear. Condylomata of Both—Canals. By H. Knapp 165

——— On Branchial Fistulæ at the. By Dr. D. Schwabach, of Berlin 246

Fistulæ. On Branchial—at the External Ear. By Dr. D. Schwabach, of Berlin . . . 246

Fluids. An Instrument for Removing—from the Tympanum. By Dr. Schalle, of Hamburg,. 215

Formation. On the—of Sequestra in the Mastoid Process of the Child. By Dr. Arthur Hartmann, of Berlin . . . 26

Hæmatoma. On a Traumatic Movable—of the Membrana Tympani. By Prof. S. Moos, of Heidelberg 332

Histology. Normal and Pathological Anatomy and—of the Organ of Hearing. By H. Steinbrügge, of Heidelberg 89, 205

——— The—of the Inferior Turbinated Bones, and of the Teleangiectatic Fibromata arising from them. By H. Steinbrügge, M.D., of Heidelberg. (With Plates I and II.) . . . 269

Inflammation. A Case of Acute—of the Middle Ear, with Inflammation of the Muscles of the Neck, and Facial Paralysis of the same side. Recovery. With Some Remarks upon the Indications for Wilde's Incision and Trephining of the Mastoid Process. By Dr. D. B. St. John Roosa, of New York . . . 255

——— Primary Acute Purulent—of the Middle Ear. By H. Knapp 1

Instrument. An—for Removing Fluids from the Tympanum. By Dr. Schalle, of Hamburg . 215

Internal Ear. Syphilitic Diseases of the. Being a Review of Some Recent Papers upon this Subject. By D. B. St. John Roosa, M.D. 336

Intracranial. Four Cases of—Disease Caused by Chronic Suppuration of the Middle Ear. Two Recoveries and Two Deaths. By Dr. Charles J. Kipp, of Newark, N. J. . . 147

Literature. Abstract of American Otological—for the First Quarter of 1879. By Swan M. Burnett, of Washington, D. C. . 183

——— Abstract of American Otological—for the Second Quarter of 1879. By Swan M. Burnett, of Washington, D.C. 284

——— Abstract of American Otological—for the Third Quarter of 1879. By Swan M. Burnett, of Washington 370

Mastoid Process. Extensive Caseous Osteitis of the—and Petrous Bone, caused by Chronic Purulent Inflammation of the Middle Ear. Operation. Permanent Fistula of the Mastoid. Recovery. By A. G. Gerster, M.D., of New York 81

——— Four Cases of Disease of the. By S. Moos, of Heidelberg 231

——— On Sclerosis of the. By Dr. Arthur Hartmann, of Berlin 322

——— On the Formation of Sequestra in the—of the Child. By Dr. Arthur Hartmann, of Berlin 26

——— On the Indications for Opening the—in Cases of Otitis Media Purulenta Acuta with Implication of the Mastoid Cells. By Dr. Emil Gruening, of New York 84

Meatus. A Case of Closure of the Auditory—and Loss of Hearing by the Formation of Exostoses, complicated with Acute Perforative Inflammation of the Middle Ear, with Repeatedly Recurring Granulations. Restoration by the Use of Laminaria and Galvano-Cautery. By S. Moos, of Heidelberg 223

Membrana Tympani. On a Traumatic Movable Hæmatoma of the Membrana Tympani. By Prof. S. Moos, of Heidelberg 332

Middle Ear. A Case of Acute Inflammation of the Muscles of the—with Inflammation of the Muscles of the Neck, and Facial Paralysis of the Same Side. Recovery. With Some Remarks upon the Indications for Wilde's Incision and Trephining of the Mastoid Process. By Dr. D. B. St. John Roosa, of New York 255

——— Four Cases of Intracranial Disease, caused by Chronic Suppuration of the—Two Recoveries and Two Deaths. By Dr. Charles J. Kipp, of Newark, N. J. 147

——— Note on the Treatment of Acute Suppuration of the. By Dr. Edward T. Ely, of New York 178

——— Primary Acute Purulent Inflammation of the. By H. Knapp 1

Objective. A Case of—Aural Sounds. By Dr. E. L. Holmes, of Chicago 114

——— Aural Sounds Produced by Voluntary Contraction of the Tubal Muscles. By Swan M. Burnett, M.D., of Washington, D. C. 357

Opening. On the Indications for —the Mastoid Process in Cases of Otitis Media Purulenta Acuta, with Implication of the Mastoid Cells. By Dr. Emil Gruening, of New York . . 84

Osteitis. Extensive Caseous—of the Mastoid Process and Petrous Bone, caused by Chronic Purulent Inflammation of the Middle Ear. Operation. Permanent Fistula of the Mastoid. Recovery. By A. G. Gerster, M.D., of New York 81

Otitis. On the Indications for Opening the Mastoid Process in Cases of—Media Purulenta Acuta, with Implication of the Mastoid Cells. By Dr. Emil Gruening, of New York . . 84

Otology. Clinical Contributions to. From the Practice of Dr. C. R. Agnew. Reported by Dr. David Webster, of New York 65

Otology. Report on the Progress of—in the First Half of the year 1878 . . . . 89, 187, 288

——— Report on the Progress of —in the Second Half of the Year 1878 381

Pathology and Therapeutics of the Organ of Hearing. By A. Hartmann, of Berlin 187, 288, 399

——— Contributions to the—and Pathological Anatomy of the Organ of Hearing. By Prof. S. Moos 113

Petrous Bone. Extensive Caseous Osteitis of the Mastoid Process and,—Caused by Chronic Purulent Inflammation of the Middle Ear. Operation. Permanen Fistula of the Mastoid. Recovery. By A. G. Gerster, M.D., of New York 81

Phonograph. Experiments with Edison's. By Dr. Oscar Wolf, of Frankfort-on-the-Main . . 58

Physiology of the Organ of Hearing. By Oscar Wolf, of Frankfort-on-the Main . . 98, 207, 388

Proceedings. Report of the—of the Section of Otology of the British Medical Association, held at Cork, August, 1879. (Being an Abstract of the Report published in the *British Medical Journal*, August 30, 1879.) By Dr. F. P. Capron, of Yonkers, N. Y. 360

Report on the Proceedings of the Section of Otology of the British Medical Association, held at Cork, August, 1879. (Being an Abstract of the Report published in the *British Medical Journal*, August 30, 1879.) By Dr. F. P. Capron, of Yonkers, N. Y. 360

——— On the Progress of Otology in the First Half of the Year 1878. . . . . . . 89, 187, 288

——— On the Progress of Otology in the Second Half of the Year 1878 . . , ... 381

Sclerosis. On—of the Mastoid Process. By Dr. Arthur Hartmann, of Berlin 322

Sequestra. On the Formation of —in the Mastoid Process of the Child. By Dr. Arthur Hartmann, of Berlin 26

Sinus. On the—Tympani. By Dr. H. Steinbrügge, in Heidelberg 53

Sounds. A Case of Objective Aural.—By Dr. E. L. Holmes, of Chicago 144

——— Objective Aural—Produced by Voluntary Contraction of the Tubal Muscles. By Swan M. Burnett, M.D., of Washington, D. C. 357

Suppuration. Four Cases of Intracranial Disease Caused by Chronic—of the Middle Ear. Two Recoveries and Two Deaths. By Dr. Charles J. Kipp, of Newark, N. J. . . 147

——— Note on the Treatment of Acute—of the Middle Ear. By Dr. Edward T. Ely, of New York 178

Syphilitic Diseases of the Internal Ear. Being a Review of Some Recent Papers upon this Subject. By D. B. St. John Roosa, M. D. 336

Test. A New—for Simulated One-sided Deafness. By David Coggin, M.D., of Salem, Mass. 177

Therapeutics. Pathology and—of the Organ of Hearing. By A. Hartmann, of Berlin, ... 187, 288, 399

Toynbee's. The Use of—Artificial Ear Drum. By Charles E. Hackley, M.D 228

Treatment. Note on the—of Acute Suppuration of the Middle Ear. By Dr. Edward T. Ely, of New York 178

Tumor. A Case of Parotidean and Intratympanic Malignant —By H. Knapp 311

——— A Case of—of the auditory nerve occupying the forsa for the cerebellum. By Geo. T. Stevens, M.D., of Albany, N. Y. 171

Tuning-Fork. Analysis of the Tones Included in the Secondary Noise of an Intermitting—By Dr. E. Berthold, of Königsberg 250

Turbinated Bones. The Histology of the Inferior—and of Teleangiectatic Fibromata arising from them. By H. Steinbrügge, M.D,, of Heidelberg. (With Plates I and II) . . . 269

Tympani. On the Sinus—By Dr. H. Steinbrügge, of Heidelberg 53

Tympanum. An Instrument for Removing Fluids from the—By Dr. Schalle, of Hamburg . . 215

0

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